Graw-Hill
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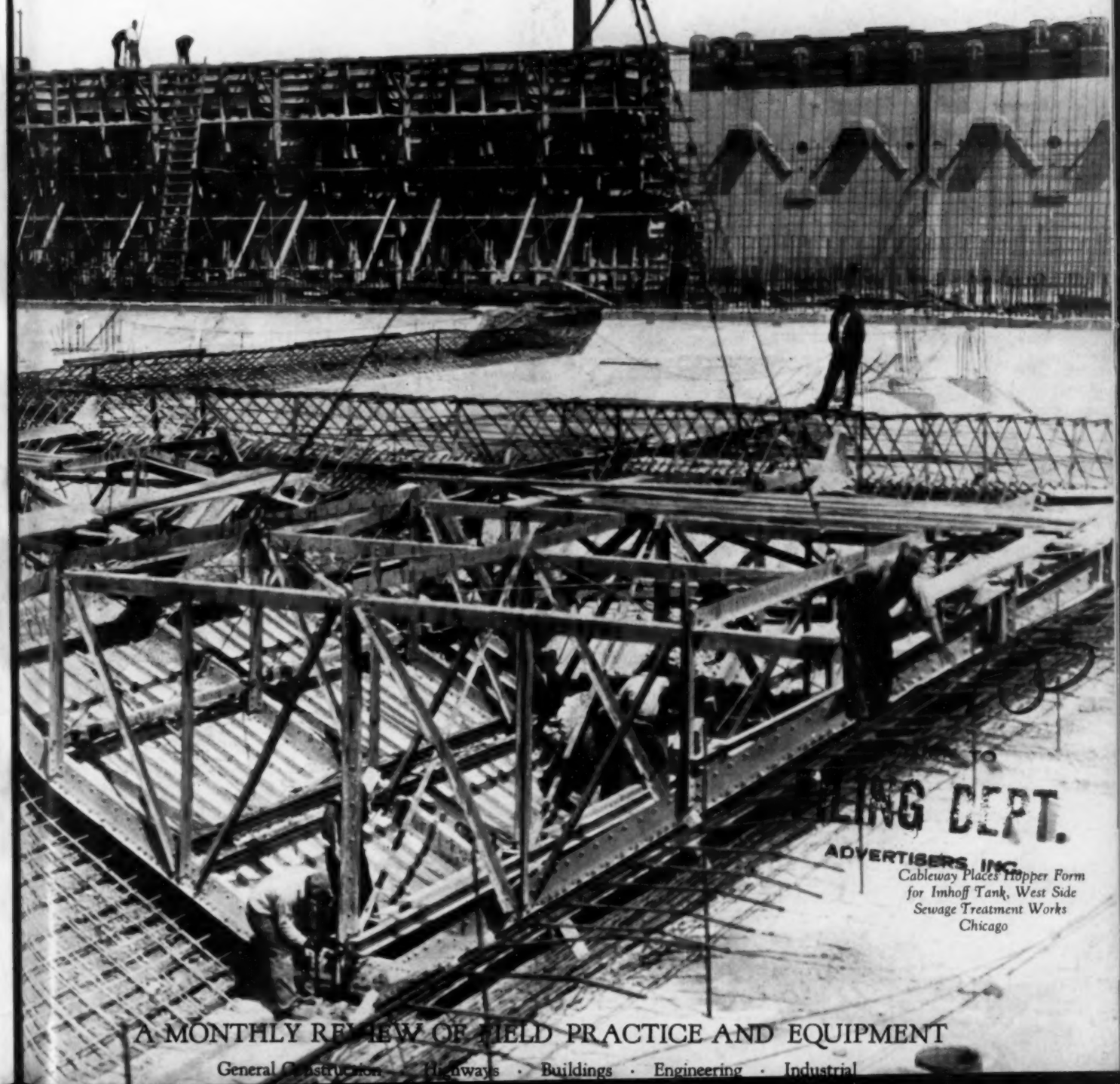
Company, Inc.

Construction Methods

November
1931



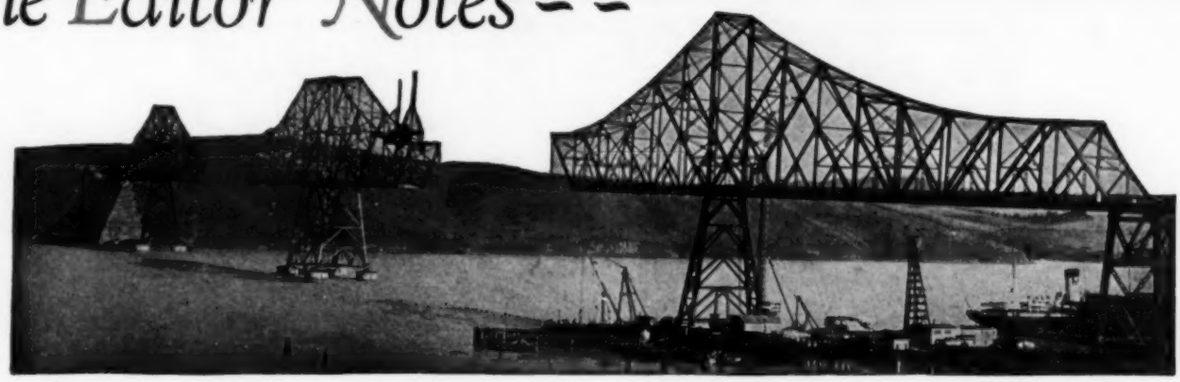
Cableway Places Hopper Form for Imhoff Tank, West Side Sewage Treatment Works Chicago

A MONTHLY REVIEW OF FIELD PRACTICE AND EQUIPMENT

General Construction · Highways · Buildings · Engineering · Industrial

CONSTRUCTION METHODS, November, 1931. Vol. 13, No. 11. Published monthly. McGraw-Hill Publishing Company, Inc., 330 West 42d Street, New York, N. Y. $1 per year. Foreign Postage, $1.00. Canada (including Canadian duty), $1.50. 10 cents per copy. Entered as second-class matter, October, 1926 issue. Vol. 8, No. 10, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

The Editor Notes - -



Something Practical on Construction Safety

OUT of the welter of posters, slogans, "pep" talks and other well-meaning, but tiresome, generalities with which the movement for safety on construction work has been surfeited, it is a welcome relief to receive something in the form of specific suggestion with a real, practical application to the job. To the cause of accident prevention a committee of the Building Trades Employers' Association of New York has made a valuable contribution in its report on material platform hoists, reprinted, in part, elsewhere in this issue.

Here is something that the construction man can get his teeth into. He's had an overdose of the cheer-leader type of safety exhortation. He's a little weary of the formula, "Now fellows, let's all get together and with nine long rahs make the job safe for God, for country and for dear, old Siwash." The outstanding feature of the committee's report on hoists is that it gets down to cases. It shows, by concrete example, what measures can be followed to provide reasonable safety for life and limb of the building contractor's men.

For the three-year period ending June 30, 1929, statistics of the New York State Department of Labor show a total of 249 construction hoist and elevator injury cases, of which 28 resulted in death or permanent total disability, 75 in permanent partial disability and 146 in temporary disability. The outstanding causes of hoist accidents seem to lie in faulty signaling, leaning into the shaft to locate the position of the car, working in an adjoining shaftway, using the hoist as a scaffold and riding hoists. Objects falling into the shaftway are also a constant source of danger.

While it is true that hoist accidents result in injuries that may be more severe than other classes, it is also true that they can be more easily eliminated by safeguards, safety rules and practices. The human factor can not be completely controlled, but if the exposure be minimized, the hazard will be lessened. The committee's report suggests definite safeguards to reduce the losses due to these accidents.

CONSTRUCTION METHODS

A monthly review of modern construction practice and equipment

ROBERT K. TOMLIN, *Editor*

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McGraw-Hill Publishing Company, Inc.

330 West 42d St., New York, N. Y.

A Record for Steel Erection

The American Institute of Steel Construction cites what is believed to be a record for the amount of steel set by a single tool in a day. On Aug. 27 of this year a crew of the Phoenix Bridge Co. on a job at 26th St. and Pennsylvania Ave., Philadelphia, erected in place 2,033,000 lb. of steel. Included in the day's work were 71 pieces weighing a little more than 14 tons each, all of which were erected in 9 working hours. The performance was accomplished with a single erecting crane in charge of H. A. Archinal, foreman, under the general supervision of J. F. Kinter, superintendent of erection.

Can any steel erector top these figures?

COMING

in January

The annual Road Builders' issue will contain a wealth of adequately illustrated material on the construction, maintenance and improvement of high-type and low-cost roads. Numerous photographs will show valuable new developments in equipment and methods used in highway work.

Leadership in Design Needed

BOTH engineers and contractors have failed to assume their share of national leadership in the present period of depression, according to A. P. Greensfelder, president of the Associated General Contractors of America. Speaking before the recent meeting to organize the Construction League of the United States, Mr. Greensfelder said in part:

"The designers of structures for our industry have heretofore been content to follow their code of ethics which deters them from seeking employment. In other words, they were compelled to sit tight and wait for some man to come forward with an idea for a structure of some kind. Today, this seems a rather old-fashioned policy. The designing branch of the construction industry should be working at all times. Its members have the dreams, initiative and the ability. Such a combination ought to lead, rather than to be content to follow. Our architects, engineers and city planners ought to be continuously preparing planning programs. . . .

"When a community knows its needs and the people therein are aroused . . . . from time to time, they are much more likely to construct than if they have to originate the idea themselves. Leadership in design is one of our fundamental problems."

Sidelights on Empire State Building

When the construction of the recently completed 85-story Empire State Building in New York was in full swing, according to Andrew J. Eken, of Starrett Bros. & Eken, Inc., the contractors, the payroll ran to $250,000 per week and a total of 4,200 men was working at one time. There were 50 different trades in the building and more than 1,200 firms supplied equipment and materials.

They Shape the Practice of Their Industry

NOT long ago Charles F. Abbott, Executive Director of the American Institute of Steel Construction, said something to this effect:

> "Business success demands exactness. The world is filled with men who guess, or assume, or are led to understand that a certain figure is nearly, or approximately, or to all intents, accurate. But *they are bossed by the man who knows.*"

We have supplied the italics to emphasize Mr. Abbott's point that the price of business progress today is an up-to-date knowledge of what is what.

Once upon a time men learned only through personal experience; rule-of-thumb governed practice; cut-and-try was the one road to progress.

But in those days the stakes were smaller, problems were simpler, competition less exacting. Today we cannot spare the time to learn everything at first hand; we cannot risk the loss involved in cut-and-try. If we are to progress—even to survive—we must know how to learn from the experience of others.

Only by helping to make this possible has the responsible industrial journal grown to its present stature. Too often this elementary fact is forgotten and in our thinking the industrial journal is coupled with the popular periodical. To be sure, both are printed with ink on paper; but there the likeness ends.

The industrial journal does not cater to the popular taste or whim, it is not designed to entertain, to amuse or to beguile the idle hour. It is edited for the practical use of an industry by men who live and work within that industry. It gathers and makes available the spot news of the industry and the hard-learned lessons of the days' work; it provides a clearing house of working ideas and experience—the raw materials of accomplishment.

Thus it draws to itself a following of those men who "boss" their industries. It selects automatically those who dominate through their own enterprises and by their examples the policies and practices of their industry. And through them its influence thus comes to permeate all ranks of that industry.

Construction Methods is mindful of its responsibility to this forward-looking group in the construction industry—those men who are "bossing" the great bulk of its operations, who inevitably are shaping its practice because it is they who *know* what is best in methods, materials and equipment.

Willard Chevalier

Publishing Director.

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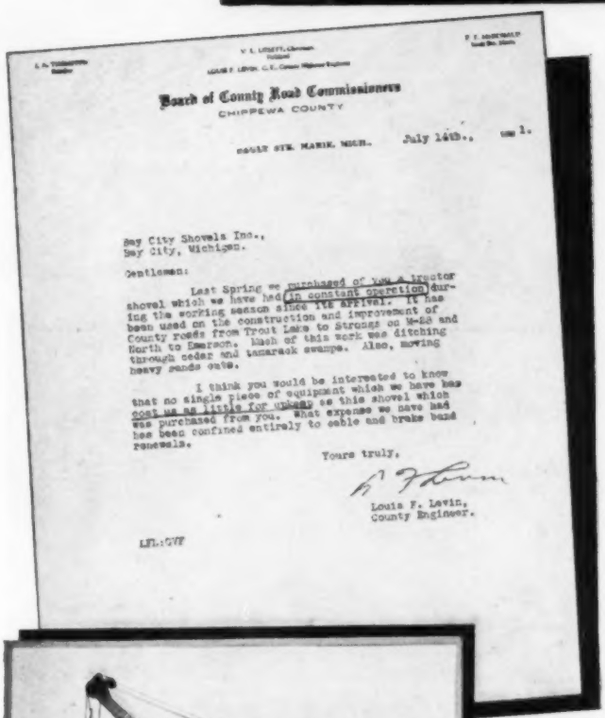
"NO SINGLE PIECE OF EQUIPMENT COST US AS LITTLE FOR UPKEEP AS THIS SHOVEL".....



Board of County Road Commissioners
CHIPPEWA COUNTY

SAULT STE. MARIE, MICH. July 14th., 1931.

Bay City Shovels Inc.,
Bay City, Michigan.

Gentlemen:

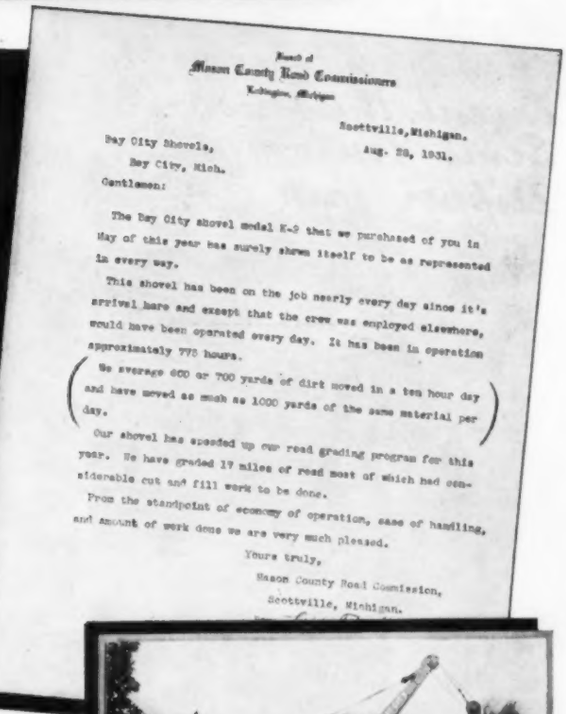
Last Spring we purchased of you a Erector shovel which we have had in constant operation during the working season since the arrival. It has been used on the construction and improvement of County roads from Trout Lake to Strongs on M-28 and North to Emerson. Much of this work was ditching through cedar and tamarack swamps. Also, moving heavy sands onto.

I think you would be interested to know that no single piece of equipment which we have has cost us as little for upkeep as this shovel which was purchased from you. What expense we have had has been confined entirely to cable and brake band renewals.

Yours truly,

Louis F. Levin,
County Engineer.

LFL:GVF



Board of
Mason County Road Commissioners
Scottville, Michigan.

Scottville, Michigan.
Aug. 28, 1931.

Bay City Shovels,
Bay City, Mich.

Gentlemen:

The Bay City shovel model K-2 that we purchased of you in May of this year has surely shown itself to be as represented in every way.

This shovel has been on the job nearly every day since it's arrival here and except that the crew was employed elsewhere, would have been operated every day. It has been in operation approximately 775 hours.

We average 600 or 700 yards of dirt moved in a ten hour day and have moved as much as 1000 yards of the same material per day.

Our shovel has speeded up our road grading program for this year. We have graded 19 miles of road most of which had considerable cut and fill work to be done.

From the standpoint of economy of operation, ease of handling, and amount of work done we are very much pleased.

Yours truly,
Mason County Road Commission,
Scottville, Michigan.

Moved up to 1000 Yds. of dirt a day!

Road Commissioners, County and State Engineers, Contractors and others are unanimous in their praise of BAY CITY equipment. Read these letters—typical of comments from many others who have found—constant operation—ease of handling—low upkeep—economy of operation—and low cost yardage, reasons to add more BAY CITIES to their fleet.

BAY CITY Shovels are made in six sizes and models, **ranging from 3/8 to full yard capacity, all equipped with powerful chain crowd. All models are convertible—use them as crane, dragline, skimmer or backfiller. BAY CITY Shovels have established a reputation of being—**

SENSIBLY DESIGNED CAREFULLY ENGINEERED
CONSCIENTIOUSLY MANUFACTURED
HONESTLY ADVERTISED FAIRLY AND MODERATELY PRICED

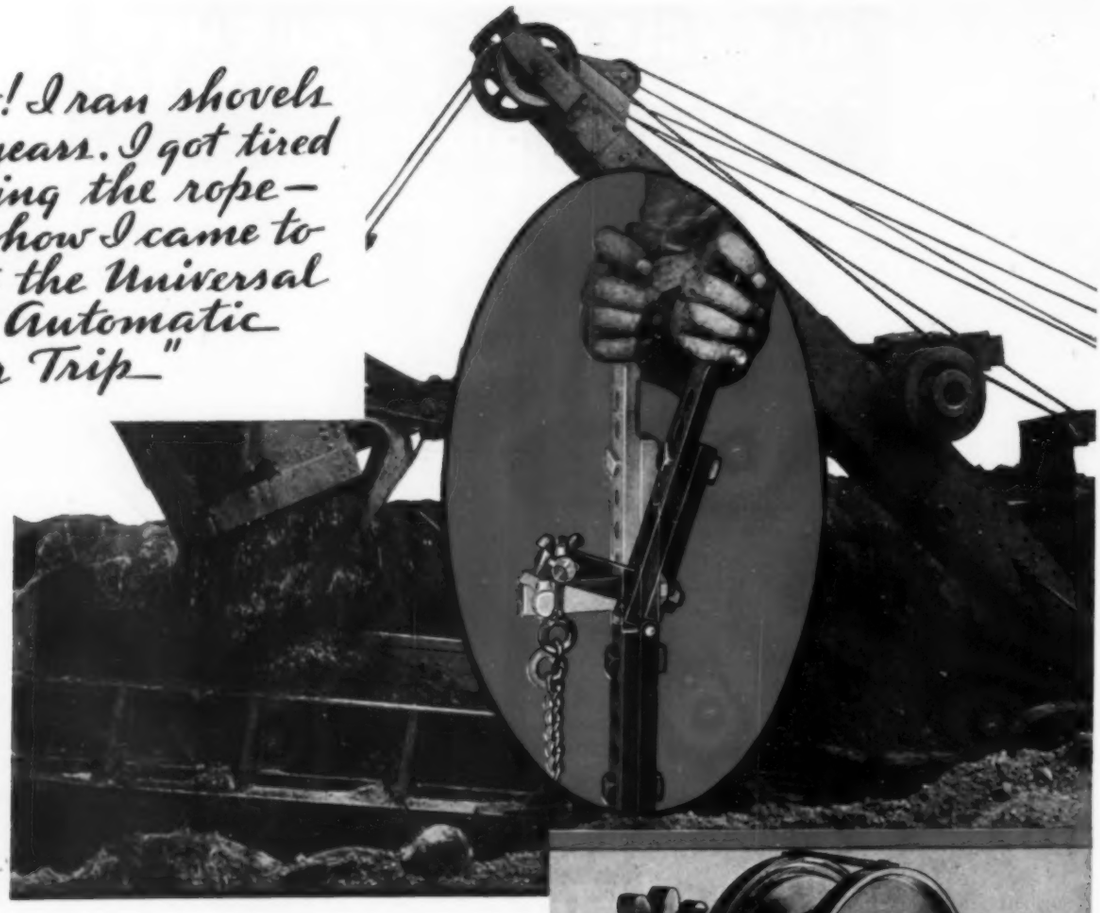
Write for complete information.

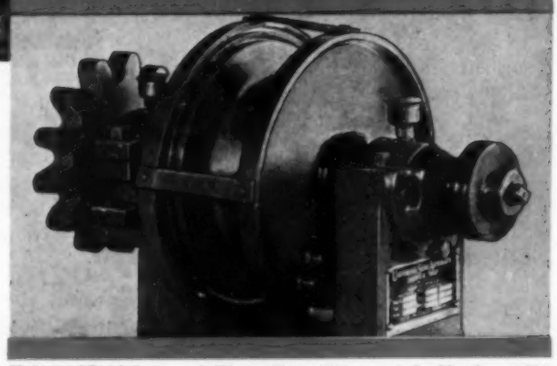
Factory and Main Office—Bay City, Mich. **Eastern Office—Roselle Park, N. J.**

BAY-CITY SHOVELS

THE BAY-CITY FAMILY
OF FAST WORKERS

"I know! I ran shovels for 15 years. I got tired of jerking the rope—that's how I came to invent the Universal Semi-Automatic Dipper Trip"





Universal Semi-Automatic Dipper Trip. This type is for Northwest 104 and 105, and the Osgood Conqueror.

FOR 15 years Mr. George G. Morin ran power shovels. He watched the waste of time in tripping the dipper. He saw how, as the day wore on, it took longer and longer to perform this tiresome operation by hand. So he perfected a semi-automatic trip — *the U. S. A. — and today you can add* 10% *to the yardage of every shovel with this simple mechanism.*

The dipper tripping control is made a part of one of the regular operating levers. The operator keeps his hand on the lever. When he's ready to trip, he twists his wrist, bends the handle to the left, and trips the bucket instantly. The U. S. A. Dipper Trip for gas, diesel and electric shovels consists of a shaft running continuously, driven by one of the shovel gears. On this shaft are mounted two friction discs and a drum. One is a small spring-actuated disc to take up the slack in the trip line. The other, a larger disc, trips the bucket. The unit is compact, self-contained, positive—and is made for all standard types of power shovels.

We also manufacture a full line of Steam Dipper Trips for all makes of large and small full-revolving and railroad type steam shovels.

Walk out on a job — watch your men trip buckets by hand — and you'll see right away how quick, easy, semi-automatic tripping would pile up savings in power and time, and step up yardage. Write the types of shovels you use, and we'll send full information.

U. S. A. Dipper Trips are optional at extra cost on Marion and Byers Shovels. Other shovel manufacturers are also installing these on new shovels when requested by the buyer. Specify U. S. A. Dipper Trip on your next shovel, and get the extra 10% yardage!

Morin Mfg. Co., Holyoke, Mass.
We'd like to know more about the *U. S. A. Dipper Trip.*
Signed.....Power Shovels, Model.....
Company.....
Address.....
.....

Morin Mfg. Co.

Holyoke, Mass.

STEERS

without swinging the cab!

with the cab in any position

ARE you still paying the tribute of delay to this hangover of the inferior construction of the good old chariots of yesterday? Are *you* still risking the danger of fouling the boom every time you turn a corner because you must swing the cab to steer?

Come up to date on steering and mobility. Find out what real mobility is!

All Northwests have always steered from the cab with the cab in any position. Positive traction—full engine power—is maintained on both crawlers at all times—even when turning.

Such a combination means a new speed—a new maneuverability that negotiates going impossible for "lame duck" crawlers that must be steered by swinging the cab. It means a new ease of handling in streets, under wires, about trees or in alleys.

Northwest brings you advantages that no other machine can offer. Check the yardages that they are getting against others.

NORTHWEST ENGINEERING COMPANY

The world's largest exclusive builders of gasoline, oil burning and electric powered shovels, cranes and draglines

1728 Steger Building., 28 East Jackson Blvd., Chicago, Ill., U. S. A.

THIS IS PAG 5

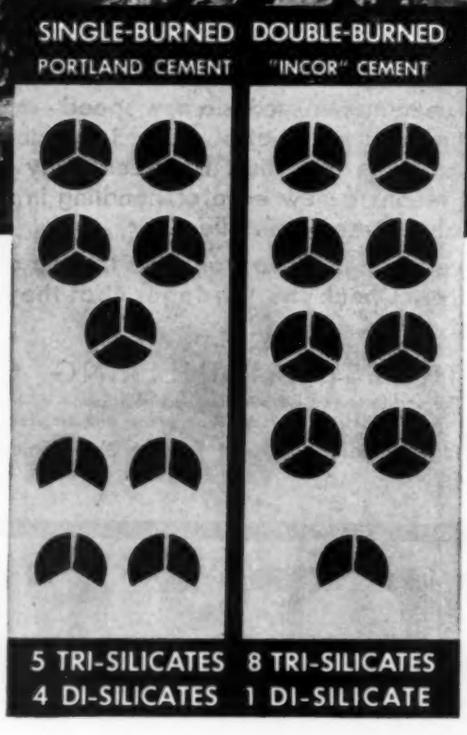
NORTHWEST

SHOVELS—CRANES—DRAGLINES—PULLSHOVELS—SKIMMER-SCOOPS

CM11Gray

"Three years old—

6390 POUNDS PER SQUARE INCH: The 3-year old "Incor" concrete core described on the opposite page withstood this pressure before shattering. This photograph of the compression machine and a broken specimen was taken immediately after the test.



HOW "INCOR" CEMENT DIFFERS: This diagram illustrates the difference in chemical composition between ordinary Portland Cement and "Incor."*

The complete circles symbolize molecules of *tri*-calcium silicate (3 atoms of lime to 1 atom of silica) which are *active* and combine readily and thoroughly with water. The incomplete circles symbolize molecules of *di*-calcium silicate (2 atoms of lime to 1 atom of silica) which are *sluggish* and combine slowly with water.

Note that the number of tri-silicates in "Incor" is *increased* 60% and that the number of di-silicates is *reduced* 75%.

*Reg. U. S. Pat. Off.

6417 pounds per square inch—*and going strong!*"

"Incor" produces 16.3% more strength than ordinary cement used on remainder of job

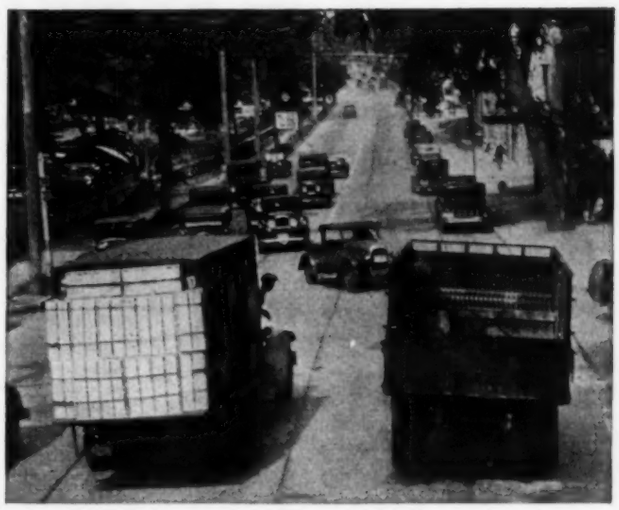
SLOW as a clock hand the massive screws of the compression machine turn, relentlessly increasing the crushing pressure on the "Incor" concrete core. Farther and farther out on the beam moves the counter-weight, past 120,000—140,000—150,000—160,000 pounds—until finally at 163,600 pounds the beam sags, and with the report of a bombshell the core shatters.

"*163,600 pounds, 6,390 lbs. per square inch, a centered break with 2 clean cones and a high percentage of broken aggregate.*"

This was the test and report of one of the three "Incor" concrete cores taken from the highway intersection at Main and Echo Avenues, New Rochelle, New York, *three years* after the concrete was placed.

The two other cores taken at the same time registered compressive strength of 6145, and 6716, respectively—an average for the 3 cores of 6417 lbs. per square inch.

Cores similarly cut from ordinary cement concrete used on the remainder of the same job, showed a strength of 5516 pounds per square inch. "*Incor*" *developed 901 pounds, or 16.3%, more strength.*



Main and Echo Avenue intersection of Boston Post Road, New Rochelle, New York, where "Incor" concrete carried 20,000 cars a day twenty-four hours after placing. The use of "Incor" obviated nine days of detouring and saved the motoring public $11,808.

Opened in 24 hours

So much for ultimate strength. What about *early* strength? When this "Incor" concrete was placed on August 6, 1928, engineers stood by, watching its behavior as compared with that of the ordinary concrete used on the adjoining part of the job. There could be no question: the "Incor" concrete *was* gaining strength rapidly. But could it carry a full load of truck traffic in 24 hours?

Test cylinders were molded as the work progressed. The following day these cylinders were tested and they *carried 2710 lbs. to the square inch.*

Ten minutes later the barriers were down, the highway open, and 20,000 cars a day were rolling over the job.

The 9 days of detouring avoided by the use of "Incor" on this job represented a cash saving to motorists of $11,808. Today the 50-odd barrels of "Incor" used on this intersection would cost but $36.75 more than ordinary cement. Every dollar spent for "Incor" representing a saving to the traveling public of $321!

The diagram on the opposite page shows the radical difference between Portland cement which is burned in the kiln *once* and "Incor" which is *double-burned.*

Notice that "Incor" has 60% *more tri*-calcium silicate and 75% *less di*-calcium silicate. That is why "Incor" makes better concrete and does the job in 24 hours instead of one or two weeks.

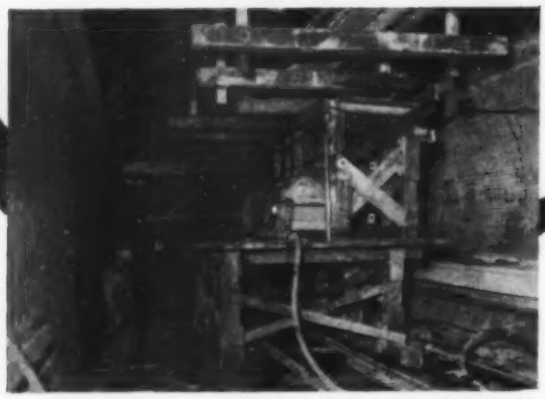
In 1928, "Incor" cost twice as much as Portland cement. Today the difference is so slight as to represent a small fraction of the economies which it produces.

INCOR *24-Hour Cement*

MANUFACTURED BY THE "DOUBLE BURNING" PROCESS

"INCOR" Cement is made by the producers of Lone Star Cement, under basic patents owned by International Cement Corporation, New York City

the STORY of Ransome PNEUMATIC PLACERS



Placing roof of Vehicular Tunnel—New York City to Jersey City.

Ransome 14-ft. Horizontal Pneumatic Placer. Capacity 14 cubic feet per shot.

Ransome Pneumatic Grout Mixer and Placer.

Every contractor and every engineer who has a problem of placing concrete in subways, railroad tunnels, water tunnels, sewers or mines should have a copy of our new illustrated 24-page Bulletin No. 105 B.

It tells the advantages of using the Ransome Pneumatic Concrete Placer and the Ransome Pneumatic Grout Mixer and Placer—lists important jobs—contains air requirements, outputs and other operating data. It is a hand book on placing concrete and grout by compressed air.

Send for a free copy—and mail the coupon.

FILL OUT AND MAIL THIS COUPON FOR DETAILED INFORMATION ON SPECIFIC JOBS

1. Length of tunnel, end to end.....
2. Length between shafts.....
3. Height and width in rough.....
4. Height and width, finished section.....
5. Minimum thickness of concrete and point at which it is found.....
6. Amount and location of reinforcing.....
7. Is tunnel in rock or earth?.....
8. Will tunnel excavation be completed before lining?.....
9. If mucking, while lining, must muck cars pass through forms?.....
10. If in soft ground, will concreting follow up behind heading?.....
    Estimated distances.....
11. Length of form used, steel or wood, and print of same.....
12. Type of concrete cars. Height and width.....
13. Locomotive (if used). Height and width.....
14. Size and kind of gravel or stone used.....
15. Compressed air available in cubic feet per minute.....
16. Will drills, air hammers, etc., operate from this supply when blowing concrete?.....
17. Gauge and size of track used.....
18. Electric current available for operating motor on placer.....
19. How much yardage to be placed by air is involved?.....
20. What length of time allowed for placing this yardage?.....
21. Make sketch showing measurements mentioned in 3, 4, 5 and 6.....
22. For whom is job being done?.....

Location of job.....

Name.....
Company.....
Position.....
Address.....
City.....State.....

Ransome Concrete Machinery Company
1850—Service for 81 Years—1931
Dunellen New Jersey

High Output +

Low Cost per Yard =

PROFITS

A matter of the RIGHT *machine*

Bucyrus-Erie offers you this *right* machine.

From a complete line of excavating and materials handling equipment, you can choose the type, size and power that will give you high output at lowest costs on your particular work.

When you buy a Bucyrus-Erie, you also buy a working alliance with the largest and most experienced group of excavating equipment engineers in existence.

A-301

BUCYRUS ERIE

BUCYRUS-ERIE COMPANY
South Milwaukee, Wisconsin

Representatives throughout the U. S. A. *Branch Offices*: Boston, New York, Philadelphia, Atlanta, Birmingham, Pittsburgh, Buffalo, Detroit, Chicago, St. Louis, Kansas City, Mo., Dallas, San Francisco. Offices and distributors throughout the world.

1/2-yard
5/8
3/4
7/8
1
1-1/4
1-1/2
1-3/4
2
2-1/4
2-1/2
3
3-1/2
4
4-1/2
5 and up to 16 yards

Shovel
Drag-lines
Clam-shells
Lifting Cranes
Drag-shovel
Magne Cranes
Tunnel Shovel
Dredge
Drag-line Bucket

Gaso-line
Diesel
Gas + Air
Electric
Steam
Diesel-Electric

Manhattan Rock

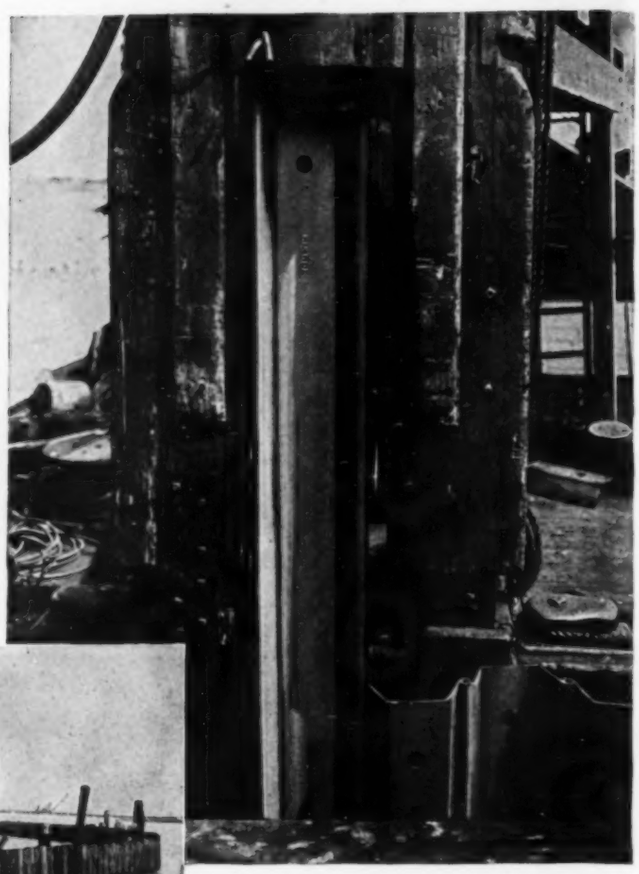
High carrying costs force close time limits on New York City excavations. Shovels must produce or get off the job. In New York City, on the foremost projects★ started during the last two years, more Lorain shovels were used than all other makes of gas shovels combined. The Thew Shovel Company, Lorain, Ohio.

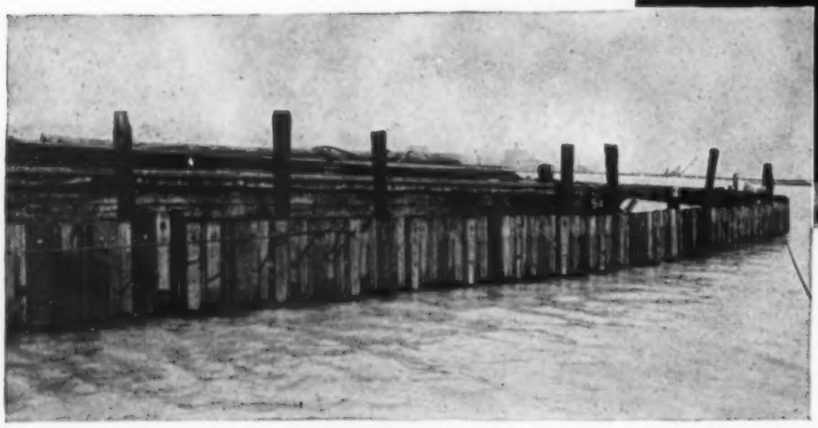
★ *Includes: Empire State Bldg., Radio City, Metropolitan Life Bldg., N. Y. Times Bldg., R C A Bldg., Tudor City, Daily News Bldg.*

THEW-LORAIN

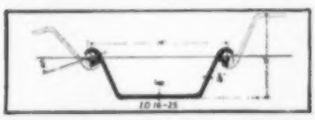
THE FIRST INLAND PILING

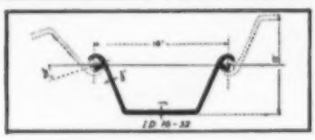
"Perfect in Every Detail"





Left—The first installation of Inland Sheet Piling, (Section ID 16-25), the dock wall at Montrose Ave. Harbor, Lincoln Park, Chicago. Fitzsimons & Connell Dredge & Dock Company, Contractors. Above—Driving a section of piling on the same job.





Section No.	Width	Lbs. per Sq. Ft. of Wall
ID 16-25	16"	25
ID 16-32	16"	32
IA 15-34	15"	34

"Inland's Piling rendered perfect performance in every detail." These are the words of the man in charge of the installation of the first order for Inland Steel Sheet Piling, a veteran who has handled all types of Piling on countless applications over a long period of time.

His sentiments have been echoed by others, well pleased with the driving ability, the strength of interlock—the *high quality of Inland's Sheet Piling.*

Inland is now equipped to furnish three Piling Sections—two of the deep arch type—ID 16-25 (16" wide, 25 lbs. per square foot of wall) and ID 16-32 (16" wide, 32 lbs. per square foot of wall) and one of the arched web type—IA 15-34 (15" wide, 34 lbs. per square foot of wall.) Other sections are to be added, so that the Inland line will soon be complete.

Details of the sections will be furnished on request and Inland would welcome the opportunity of discussing your Piling problems with you. INLAND STEEL COMPANY, 38 S. Dearborn Street, Chicago, Illinois.

INLAND STEEL

ABLE SERVANT OF THE CENTRAL WEST

Sheets Bars Plates Structurals Piling

Rails Track Accessories Bands Rivets Billets

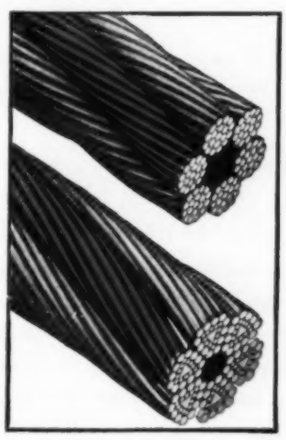
"HERCULES" RED-STRAND
REG. U.S. PAT. OFF.
WIRE ROPE

What Are Your Answers to These Questions?

Are you interested in the kind of wire rope that is dependable, even under extremely severe conditions? Do you want to minimize the time your equipment is idle while wornout ropes are being replaced? Do you consider final results more important than first cost?

If your answers to the above questions are "Yes"—then you owe it to yourself to give "HERCULES" (Red-Strand) Wire Rope a chance to show you just what it can do. Don't hesitate to try it on your hardest work.

There are good reasons why this wire rope is able to give such remarkable service, but the main point is that it does. Its service record continues to make and hold friends, for, after all, results are what count.



If you will tell us how you use wire rope, we shall be glad to suggest the construction of "HERCULES" (Red-Strand) Wire Rope that will be best for your conditions.

Feel free to write us about any wire rope problem that you may have.

Furnished in "Patent Flattened Strand" and "Round Strand" construction in order to meet all working conditions

Made Only by A. Leschen & Sons Rope Co. Established 1857

5909 Kennerly Avenue
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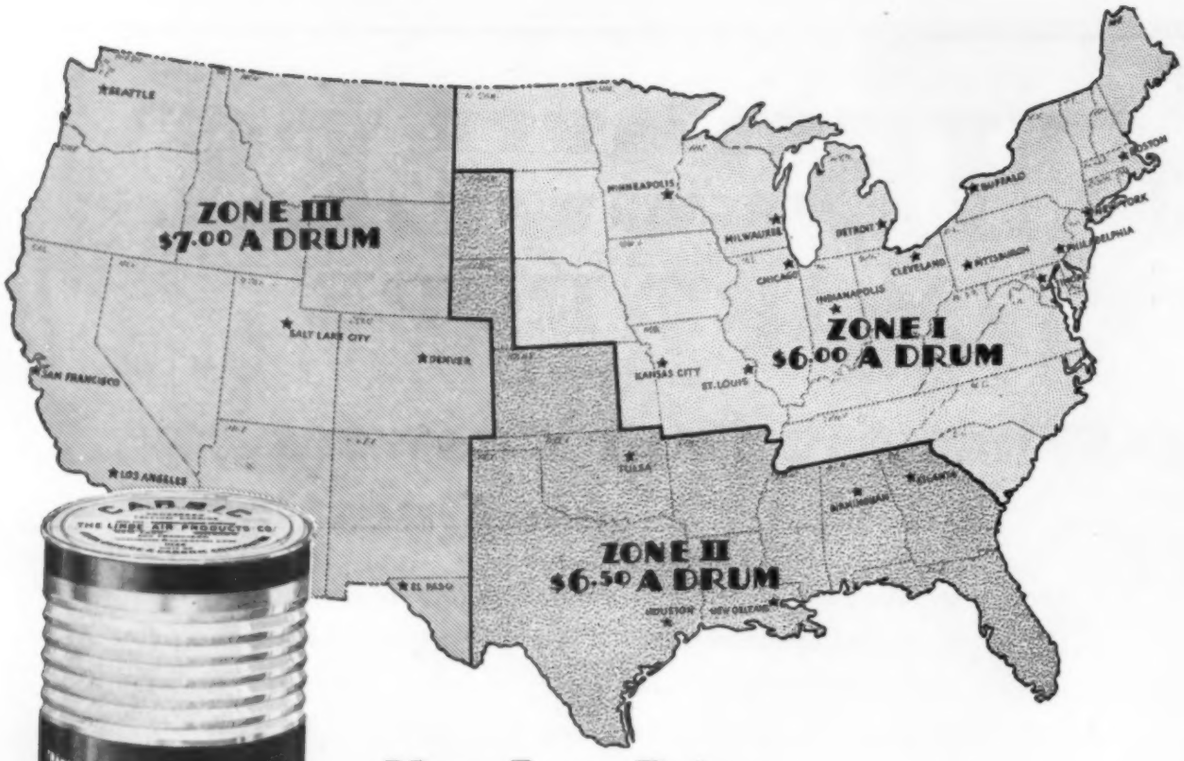
New York Chicago Denver San Francisco

Distributors at over 100 different points. The name of our Distributor in any particular locality will be gladly furnished upon request.



New Low Prices
Further Emphasize Carbic Advantages

RECENT price reductions, totaling in most zones as much as $30.00 a ton, make the many advantages of Carbic more attractive than ever.

The new prices are F. O. B. shipping point and are the same for either the smaller No. 5 Carbic in the 108-cake drum or the large No. 20 Carbic in the 40-cake drum.

Carbic, made especially for Carbic Flood Lights and Generators, is an ideal source of portable acetylene. Every cake of Carbic is made of selected high-grade calcium carbide, carefully processed and wrapped in wax paper to assure maximum gas yield. Carbic will keep indefinitely in any climate until used. There is no deterioration, no loss.

Carbic is quickly available everywhere. You can order from your Jobber or direct from the nearest Linde District Office. From either source you will benefit from the new low Carbic price now prevailing in the zone in which you are located.

Carbic Advantages

1. New low prices
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7. Sold by most Jobbers or direct by us from the Union Carbide Warehouse stock nearest you

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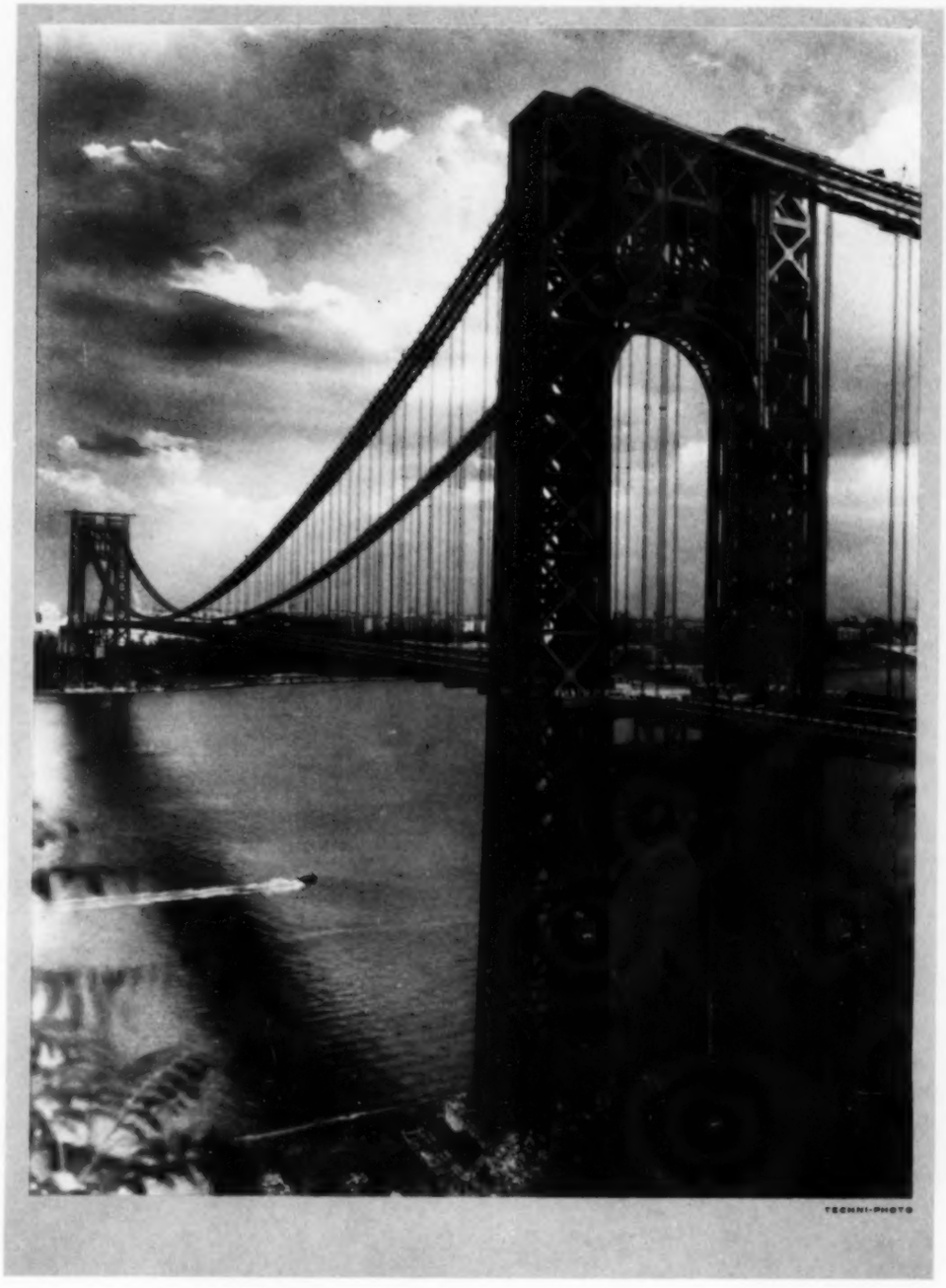

HAIL! THE SPAN SUPREME

THE MIGHTY GEORGE WASHINGTON . . . KING OF SUSPENSION BRIDGES . . . SPANNING THE HUDSON RIVER BETWEEN NEW YORK AND NEW JERSEY . . . FORMALLY OPENED SATURDAY THE TWENTY FOURTH DAY OF OCTOBER, NINETEEN HUNDRED & THIRTY ONE

Cables By Roebling

JOHN A. ROEBLING'S SONS COMPANY, TRENTON, NEW JERSEY

Atlanta · Boston · Chicago · Cleveland · Los Angeles · New York · Philadelphia
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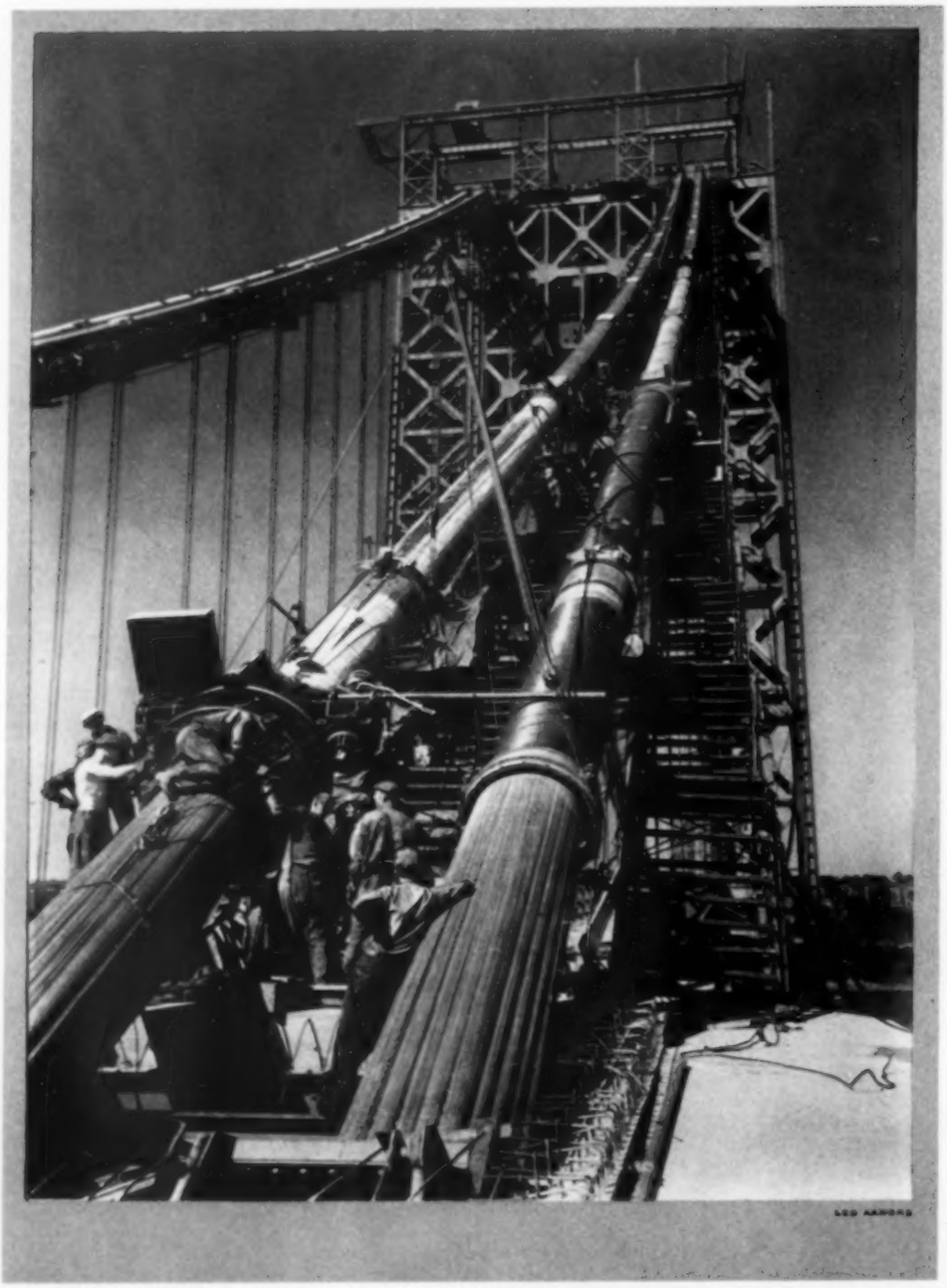

Number of cables, 4 · Diameter of cable, 36 inches · Total length of cables between anchorages, 5,212 ft. · Number of parallel wires in main cables, 105,896 · Total length of wire in main cables, 107,000 miles · Total weight of wire in main cables, 28,500 tons Total strength of main cables, 350,000 tons · Number of suspender ropes, 1,184 · Diameter of suspender ropes, 2¼ inches

GEORGE WASHINGTON BRIDGE
CABLES BY ROEBLING

THE RECENTLY OPENED GEORGE WASHINGTON IS THE WORLD'S LARGEST SUSPENSION BRIDGE. SPANNING THE HUDSON RIVER, IT LINKS FORT LEE, NEW JERSEY AND FORT WASHINGTON, MANHATTAN, NEW YORK. $60,000,000 IS THE ESTIMATED COST OF CONSTRUCTION. ' ' WITH TOWERS RISING 635 FEET ABOVE WATER AND A MAIN SPAN 3,500 FEET IN LENGTH, IT DWARFS NEW YORK'S OTHER ROEBLING CABLE EQUIPPED BRIDGES, LONG FAMOUS FOR THEIR SIZE AND MAJESTY.

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JUST WHAT DO YOU WANT A CLAMSHELL BUCKET TO DO?

If Your Demands Are Here . . . You'll Want To Know More About An Owen . . . .

If you want a bucket that will tackle every job you give it, and get through with it in the shortest time—

If you want a bucket that digs straight down, deep into the material, grabs a capacity load every time, dumps clean—with no waste motion—

If you want a bucket that does a "bigger day's work than any other bucket of the same weight and capacity" and that, assured by positive guarantee—

If you want a bucket that stands up under hard work with no breakage, and that gives longer life—

If you want a bucket that pays for itself in time saved and extra yardage—

You'll want an Owen—because Owen Buckets are making good in all of these requirements for satisfied owners, everywhere.

Jot down the particular kind of work a clamshell bucket must do for you and we'll send you some valuable data on the Owen that will pay for itself doing it for you.

The Owen Bucket Co., 6023 Breakwater Ave., Cleveland, O.

Owen Buckets

A MOUTHFUL AT EVERY BITE

Keep his head up

and we'll all come through!

You recognize this man. He lives in your own town, not far from you . . .

Though faced with unemployment, he is combating adversity with courage. He has retreated step by step, but fighting. He has spread his slender resources as far as they will go.

This winter he and his family will need your help.

There are many other heads of families much like him in the United States. This winter all of them will need the help of their more fortunate neighbors.

This is an emergency. It is temporary. But it exists. It must be met with the hopefulness and resource typical of American conduct in emergencies.

Be ready! Right now in every city, town and village, funds are being gathered for local needs—through the established welfare and relief agencies, the Community Chest, or special Emergency Unemployment Committees . . .

The usual few dollars which we regularly give will this year not be enough. Those of us whose earnings have not been cut off can and must double, triple, quadruple our contributions.

By doing so we shall be doing the best possible service to ourselves. All that America needs right now is courage. We have the resources. We have the man power. We have the opportunity for world leadership.

Let's set an example to all the world. Let's lay the foundation for better days that are sure to come.

The President's Organization on Unemployment Relief

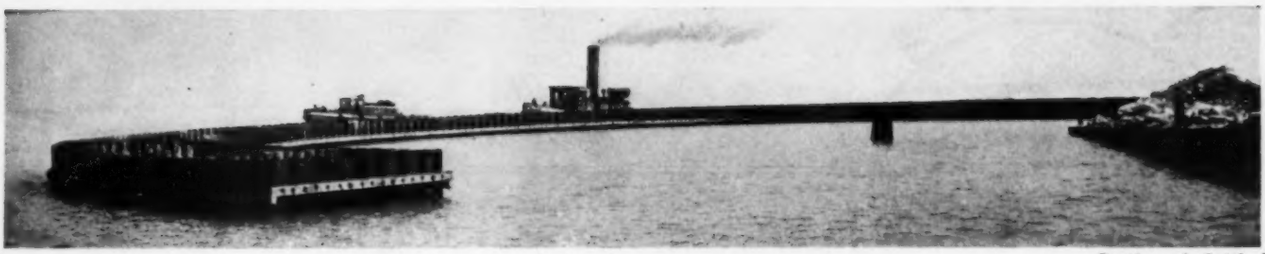
Walter S. Gifford

WALTER S. GIFFORD, DIRECTOR
Committee on Mobilization of Relief Resources

Owen D. Young

OWEN D. YOUNG, CHAIRMAN

The President's Organization on Unemployment Relief is non-political and non-sectarian. Its purpose is to aid local welfare and relief agencies everywhere to provide for local needs. All facilities for the nation-wide program, including this advertisement, have been furnished to the Committee without cost.



Portion of finished Breakwater

LACKAWANNA Deep-Arch PILING

used in constructing 4500 lineal feet of stone-filled Breakwater and Jetty

Portion of finished Jetty

Contractor:
Great Lakes Dredge and Dock Co.

FORTY-FIVE HUNDRED TONS of Lackawanna Steel Sheet Piling Section DP165, in 40 and 42-foot lengths, were used in the installation of a 2000-foot breakwater and a 2500-foot jetty in about 20 feet of water, for the Lincoln Park Commission, between Montrose Avenue and Margate Terrace, Lincoln Park Extension, Shore Land Reclamation, Chicago, Ill.

Both the breakwater and the jetty consist of two walls of Lackawanna Section DP165, from 14 to 20 feet apart, tied together with steel tie rods and filled with quarry-run stone and 3 to 6 ton cap stones. A sloping toe of riprap 8 feet high was placed on the lake side of both installations to prevent scouring.

Because of the pressure against the sheet piling, due to the new sand fill and long space between the tie rods and the bottom, it was essential that the piling used possessed high transverse strength. Lackawanna Deep-Arch Section DP165 was particularly suitable because it combines high transverse strength and a strong positive interlock with low weight per square foot of finished wall.

The marked success of Lackawanna Steel Sheet Piling in beach and shore protection structures, has been an important factor in its greatly increased use for such structures.

There is a Lackawanna Piling Section—Deep-Arch, Arch-Web or Straight-Web—for every purpose. Bethlehem engineers will gladly cooperate with you and suggest the section most suitable for your job.

BETHLEHEM STEEL COMPANY *General Offices:* **Bethlehem, Pa.**

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Buffalo, Pittsburgh, Cleveland, Cincinnati, Detroit, Chicago, St. Louis, Dallas, Houston.
Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Seattle, Portland, Honolulu.
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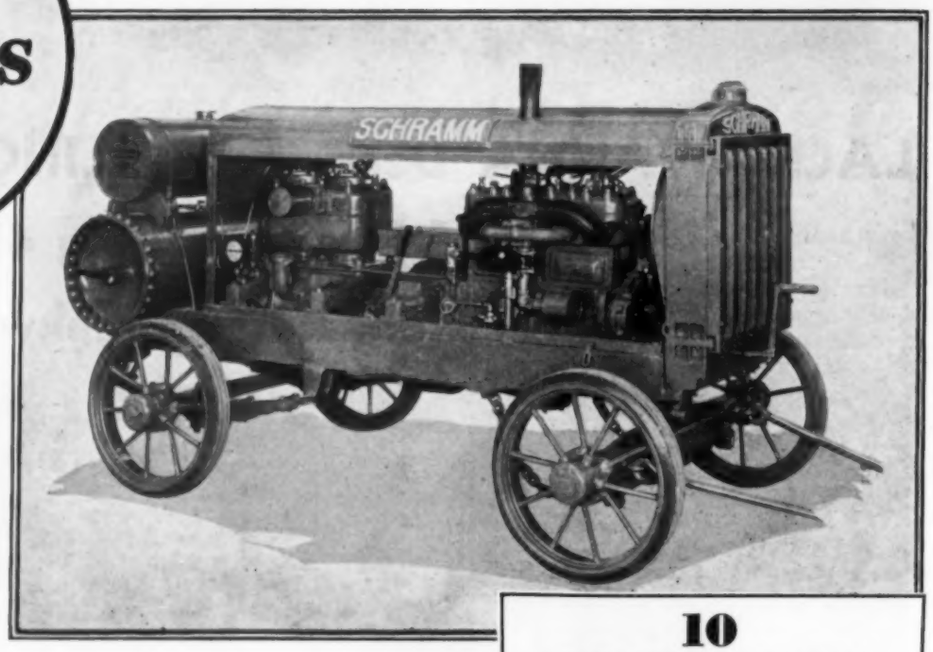
BETHLEHEM

10 REASONS WHY

You Will Buy a

SCHRAMM



There are *many* reasons why you will eventually buy a Schramm. We've listed ten of these, not because they are the most important, but because they are the reasons most frequently mentioned by owners and operators when asked "Why do you prefer or buy Schramm Compressors?"

Let us tell you all the reasons why your next Compressor should be a Schramm. Or better still, and even more convincing, put a Schramm to work and let it prove its value. Write us and we'll put you in touch with the nearest Schramm representative.

10 REASONS WHY

1. Powered by heavy duty Buda Engine.
2. Equipped with the exclusive SCHRAMM clutch for easy starting.
3. Improved and highly efficient type of disc valve.
4. Cylinders are cast in one block, separate from cylinder head and base.
5. Drop-forged crankshaft of special alloy steel with integral counterweights.
6. Oil pan can be lowered for adjustment and inspection of bearings.
7. Unloader pilot valve and slow-down governor provide positive automatic control.
8. Compressor and Engine cooled by separate water lines.
9. Heavy-duty, large capacity radiator, protected by wire mesh screen and angle bars.
10. Sizes from 1 to 720 cu. ft., any style mounting, sold and serviced by a nation wide organization.

Schramm Inc.

WEST CHESTER, PENNSYLVANIA

BRANCHES:

New York	Tulsa
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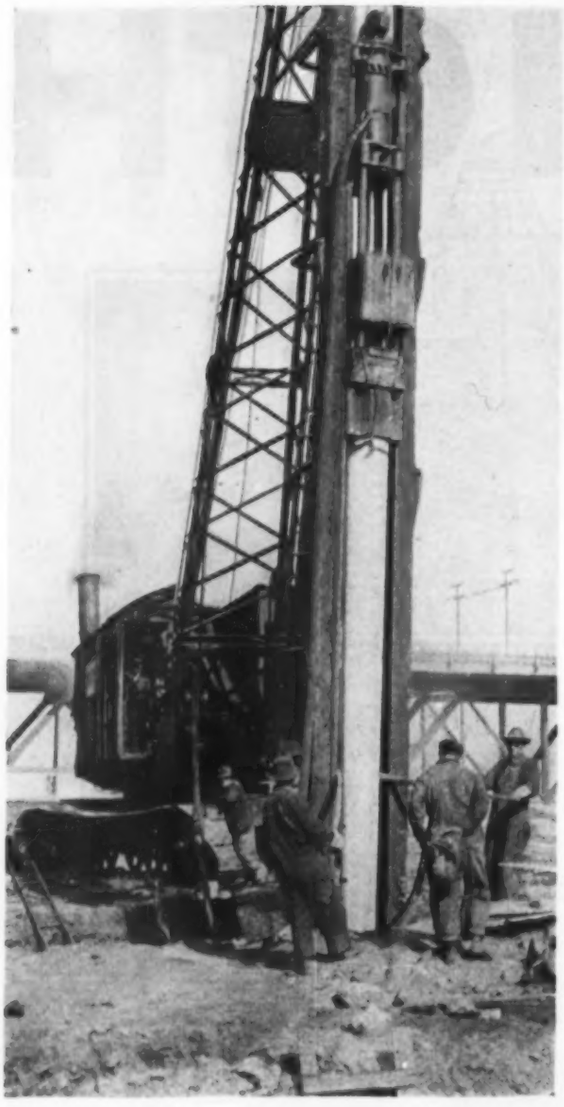

balance counts—

in pile drivers, too

From motor cars to turbines, balance is one of the requisites of fine machinery sought by every designer.

In pile drivers, too, balance is important. Here it is a nice adjustment of weight and velocity of fall that produces the maximum driving energy.

Vulcan Pile Drivers embody a real "punching" action. A heavy ram, falling at low velocity, provides maximum penetration with each stroke and a minimum damage to the pile. That's why contractors and engineers prefer the Warrington-Vulcan Pile Hammer on their jobs, with its economy of energy and time.

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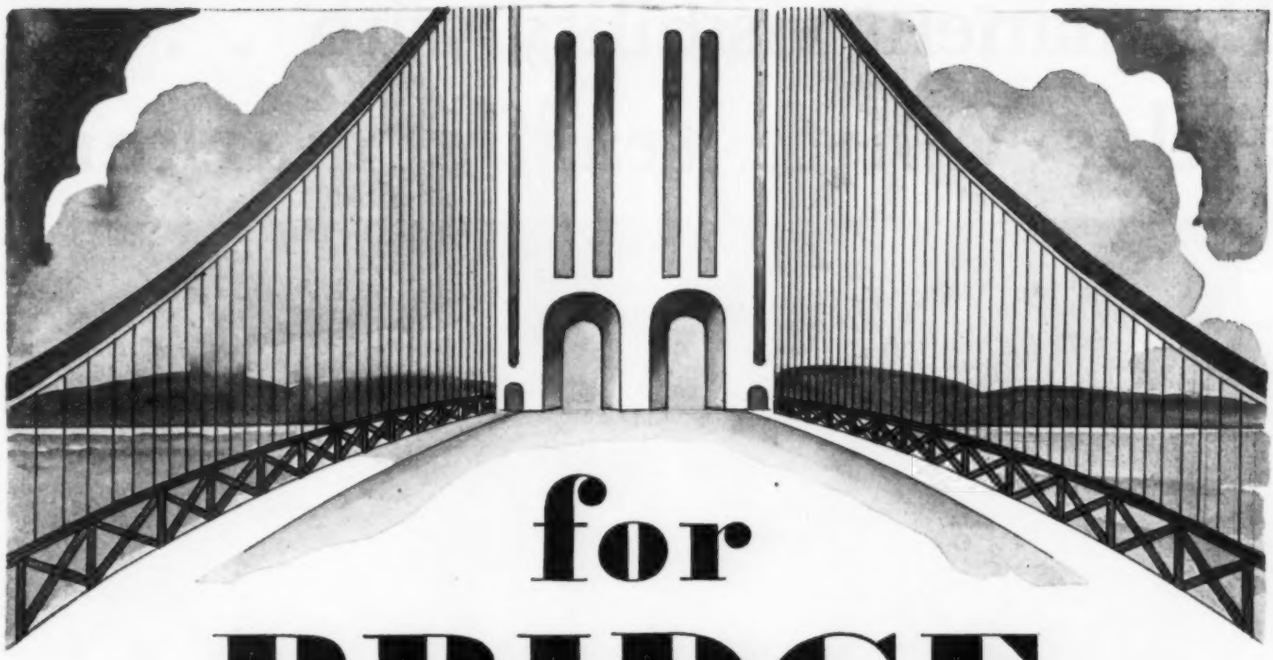
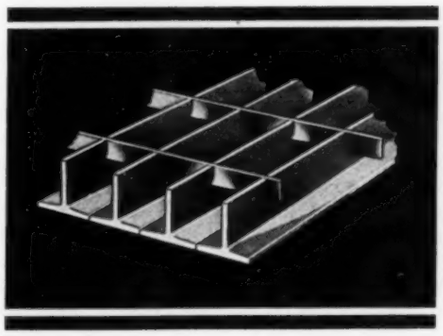
Warrington-Vulcan
PILE DRIVERS



for BRIDGE FLOORS



T-TRI-LOK efficiently and economically solves the modern bridge floor problem. Fireproof, light in weight, easily installed, adequately strong, permanent, T-TRI-LOK provides a roadway surface which meets all requirements of present-day vehicular traffic.

T-TRI-LOK is a new form of slab construction made up of structural tees mechanically interlocked with flat bars. Standard units, ready to install, are furnished in widths up to 4 feet and in lengths up to 30 feet. Various sizes of tees and cross bars are available, depending on strength of floor required.

T-TRI-LOK units are placed directly on bridge stringers and secured by bolting, riveting, welding or clipping. The cells are then filled flush with concrete, preferably vibrated into place, forming an armored concrete, non-skid wearing surface of long life and high efficiency. No forms for concrete are required. If desired, an additional wearing surface of concrete, asphalt or other suitable material may be added above the top of the steel.

Send for booklet, "T-TRI-LOK Bridge Floor Construction." Carnegie engineers are also at your service.

CARNEGIE STEEL COMPANY · PITTSBURGH, PA.

Subsidiary of United States Steel Corporation

155

T-TRI-LOK

Permanent visibility with . . . . Atlas White traffic markers

Intersection of Second Avenue South and Main Street, Seattle, showing permanent traffic markers of Atlas White concrete.

Conspicuous traffic markers that retain their visibility are secured in Seattle with lines of white portland cement concrete inserted in concrete pavement at the time it is placed. Such lines have been used for three years and have proved highly satisfactory. J. W. A. Bollong, traffic engineer, Seattle, states, "I would commend this type of traffic-line construction to any city desiring to install permanent pedestrian lanes in concrete pavement."

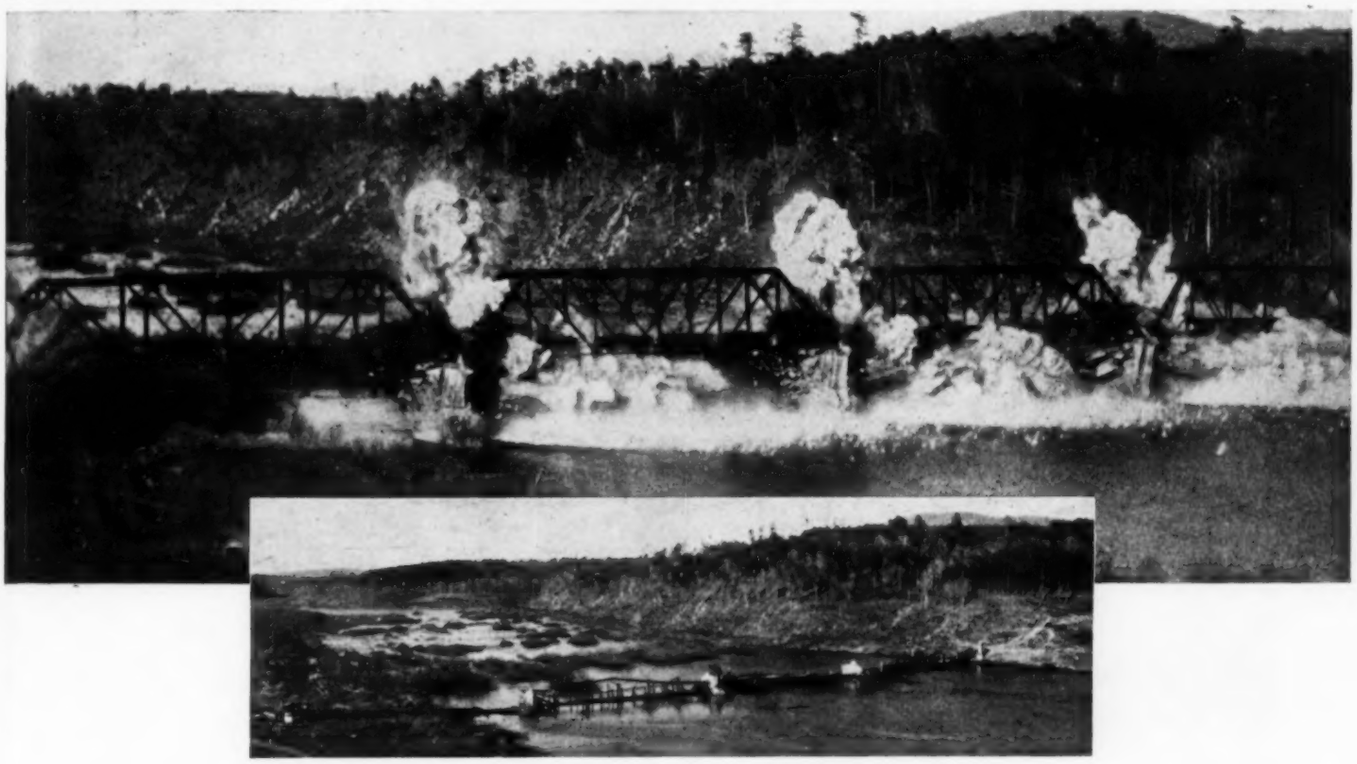
Lines of Atlas White concrete are here installed by inserting a 1 in. by 6 in. dressed plank in the concrete at the time of placing; this plank is pulled 24 hours later. The space left is filled with a mixture composed of one part Atlas White portland cement and one and one-half parts white marble chips. This is allowed to set three or four hours and then is edged off with a steel edger and the top floated with a steel float, the object being to get the white concrete as dense as possible to make it impervious to greases in the street. The 24-hour interval between placing the pavement and placing the white line permits the former to set sufficiently so that no mixing of white and gray grouts occurs.

Further information on the use of Atlas White portland cement for traffic markers will be furnished on request.

Construction
Methods
ESTABLISHED 1919—MCGRAW-HILL PUBLISHING COMPANY, INC.

ROBERT K. TOMLIN. *Editor*

VOLUME 13 NEW YORK, NOVEMBER, 1931 NUMBER 11



BRIDGE *in Reservoir Area* BLASTED

By LEE G. WARREN

Superintendent of Construction, Phoenix Utility Co., Hot Springs, Ark.

BEFORE storing water in the 7,150-acre reservoir formed by the construction of the Carpenter dam on the Ouachita River, near Hot Springs, Ark. (described in *Construction Methods* for October, page 34), government regulations required the demolition and removal of a steel bridge 672 ft. long, built in 1914 by the Memphis, Dallas & Gulf Railroad. The structure, located about 5 miles upstream from the dam, consisted of four truss spans, supported by three central piers of concrete 22 ft. high and 6 x 22 ft. in maximum cross-section and end piers, in pairs, formed by ¼-in. steel cylindrical shells filled with concrete. The tops of the piers were approximately 10 ft. above the minimum elevation for clearing the site.

As a preliminary to blasting operations, which were planned to throw the bridge upstream and direct the concussion away from a new concrete bridge 800 ft. below the existing structure, nine holes were drilled with pneumatic hammers to depths of 4 ft. in the concrete of each of the three central piers. These holes were located on a line sloping downward at a 45-deg. angle from the downstream upper corner of each pier. In addition, two 6-ft. holes were drilled under each of the bridge seats on the upstream sides of the piers. From the cylindrical casings of the end piers, enough steel was burned away by acetylene torches to allow drilling to be done. Air for drilling was supplied by a portable compressor.

The holes were loaded with a total of 350 lb. of 40 per cent Hercules dynamite by a crew in charge of H. M. Rush of the Phoenix Utility Co. All holes were connected so that the demolition would be accomplished in one blast. Current was supplied by two blasting machines connected in the lead wires and operated simultaneously.

The blast was successful in dumping the bridge into the river and cutting off the concrete piers below the desired elevation. No damage was done to the new concrete bridge near the old steel structure.

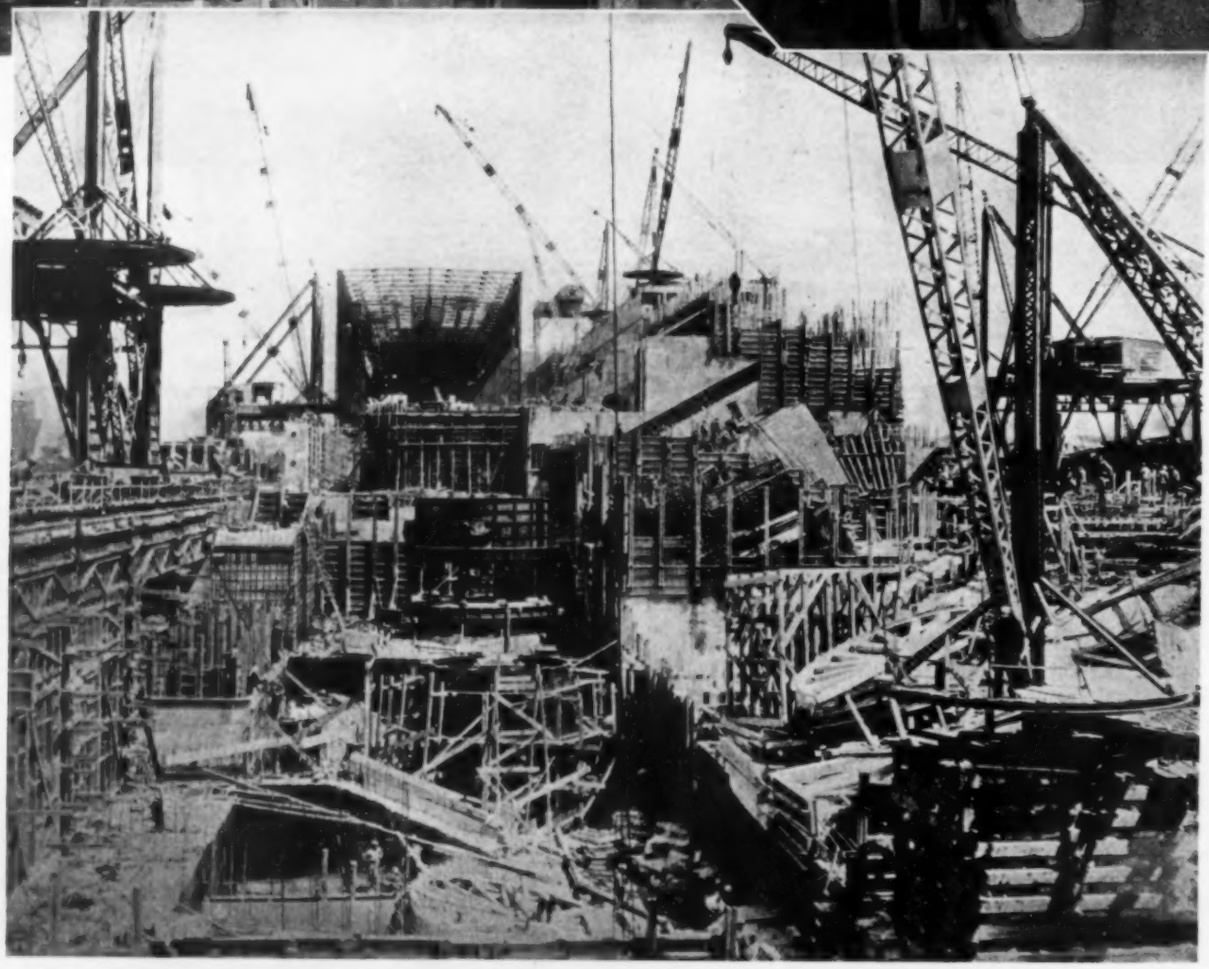
This Month's

NEW WALDORF-ASTORIA HOTEL *(in foreground)* at 49th St. and Park Ave., New York, opened last month, is 47-story structure containing 2,200 rooms, built by Thompson-Starrett Co. Towers are sheathed in copper covered with aluminum leaf. Other skyscrapers in picture are, left to right: Chrysler, Chanin, Graybar and Empire State buildings.

Halbran

BRIDGE ENGINEERS CONFER *(below)*. Consultants on $78,000,000 San Francisco-Oakland structure in California are, left to right: Daniel Moran, Leon S. Moisseiff and Ralph Modjeski.

©Wide World



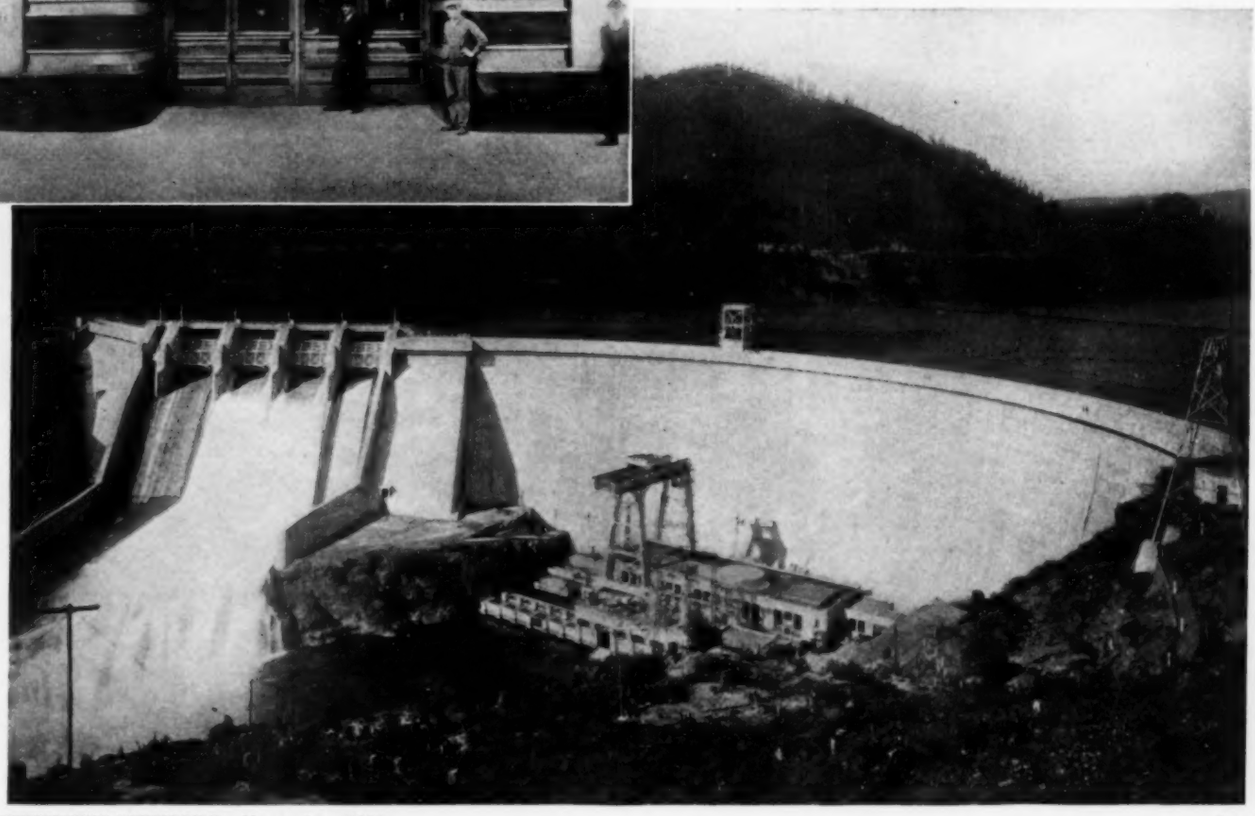
BEAUHARNOIS HYDRO-ELECTRIC PROJECT in Canada will ultimately develop full flow of St. Lawrence River. Initial installation will develop 500,000 hp. Power house, above, fed by 15-mile canal.

"News Reel"

HUDSON RIVER BRIDGE with main suspension span of 3,500 ft. between New York and New Jersey, was completed and opened to traffic last month by the Port of New York Authority.

ENTRANCE TO McGRAW-HILL BUILDING *(left)*, just completed at 330 West 42nd St., New York, and now occupied by *Construction Methods* and the company's thirty other engineering and industrial publications, is finished in polychrome enameled steel with bars of bronze and chromium.

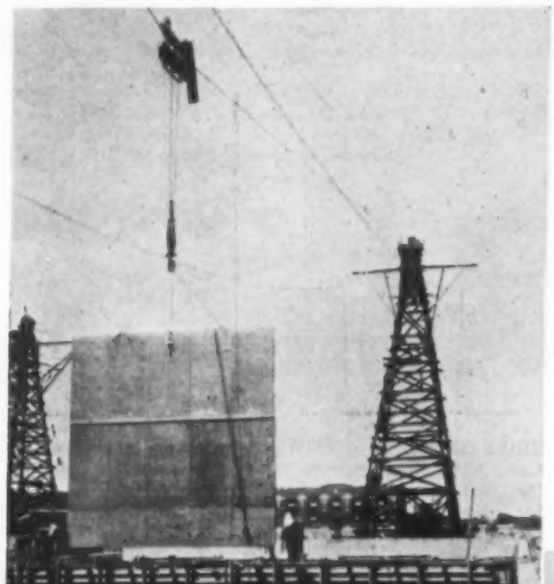
ARIEL DAM AND POWER HOUSE *(below)* on Lewis River, Washington, 25 miles north of Portland, Ore., will develop head of 185 ft., with full reservoir, for Inland Power & Light Co. Initial installation will be one 45,000-kw. unit, with provision for three others of the same size. Concrete dam is 190 ft. high above streambed.



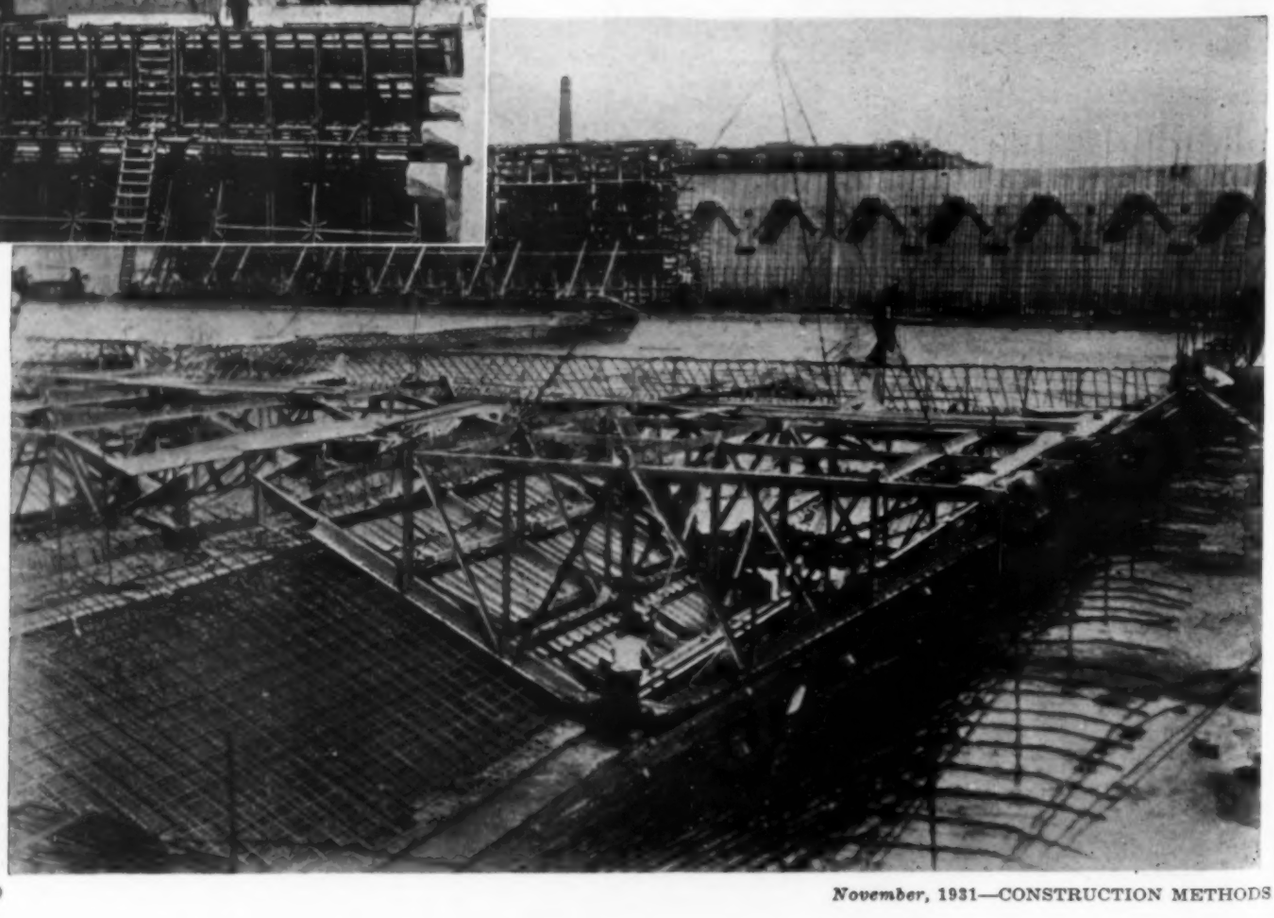
PROVED PLANT

Serves Builder of Third Battery of IMHOFF TANKS

CONSTRUCTION plant developed through the experience of a former contractor on two batteries of Imhoff tanks at the West Side Sewage Treatment Works, Chicago, is now performing efficiently for the builder of a third group of 36 tanks. During its long period of usefulness on two previous contracts, the first of which was let in 1926, the plant had been brought to a stage of near-perfection by the T. J. Forschner Contracting Co. The present user of the equipment, the S. A. Healy Co., of Detroit, is operating the equipment skillfully and is obtaining close to the maximum efficiency of the plant.

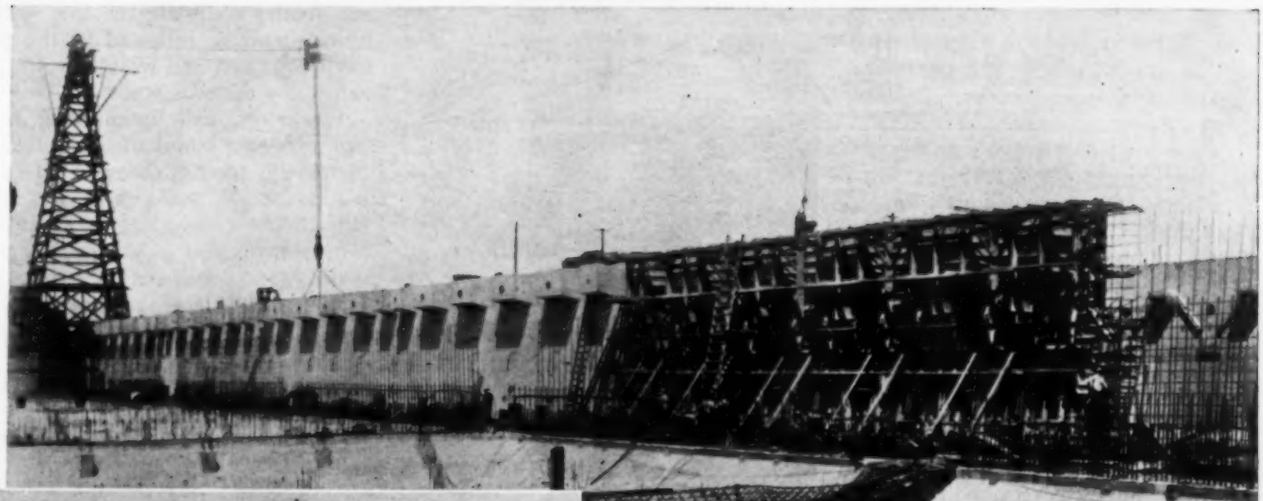


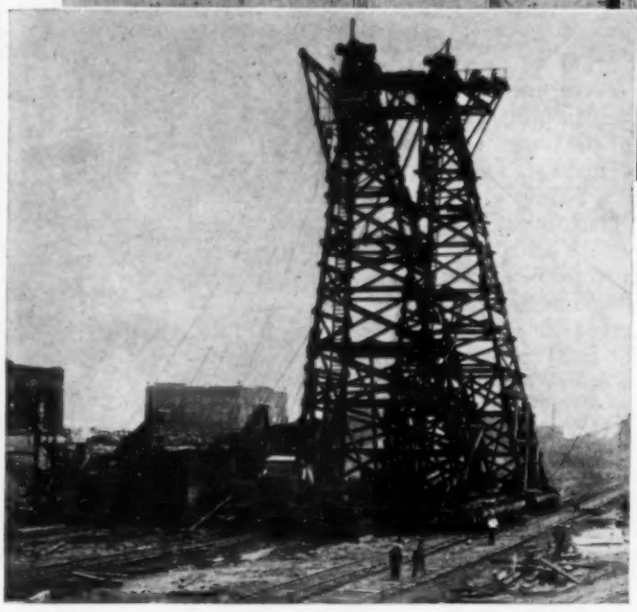
SECTION OF STEEL FORM *(left)* for inner face of intermediate wall at expansion joint is lowered into place by cableway.



FIRST HALF *(below)* of steel form for upper surface of hopper bottom is placed by cableway.

History of Plant—Contract for Battery A, the first unit of the West Side Sewage Treatment Works to be let, was awarded to the T. J. Forschner Contracting Co. in the fall of 1926. The contractor designed a central mixing plant and a traveling tower cableway to handle the work. Experience showed the one cableway to be inadequate for performing all the operations which could be handled most economically by this means. When the same company received the contract for Battery B, it added a second traveling tower cableway to its equip-





STEEL FORM *(above)* **for inner face of operating-gallery wall has weir box forms attached. In right background is east wall of battery, with inclined brackets for precast baffles.**

HEAD TOWERS *(left)* **of two cableways. Both head and tail towers operate on seven-rail tracks, with three rails under counterweighted rear end of platform and four rails under tower.**

ment. This identical equipment is now serving the S. A. Healy Co.

The original concrete plant was designed primarily to serve the construction of Battery A. Two 1-yd. mixers were installed for this work. When the T. J. Forschner Contracting Co. received the contract for the sewage pumping station, Jan. 31, 1927, it added a third 1-yd. mixer to give the necessary capacity for both jobs.

Concrete for Battery A and, later, for Battery B was transported in 7-yd. bottom-dump buckets. A standard-gage railway carried the buckets from the mixing plant to the cableway, which then handled them to position over the forms. The railway is functioning in the same way for the construction of Battery C.

On both Battery A and Battery B, the T. J. Forschner Contracting Co. excavated for the hopper bottoms of the tanks with draglines. These machines cut close to final grade and left comparatively little earth to be removed by hand. The S. A. Healy Co. is using the same type of equipment on Battery C.

Development of Forms—Main-wall forms for Battery A consisted of built-up wood sections, 20 ft. long by 25 ft. high. The sections were handled by the cableway and were assembled for the full length of a tank wall (80 ft.). Forms for the cross-walls inside the tanks also were built-up wood sections.

Hopper bottoms of Battery A were poured without forms. Dry concrete was placed on the slopes and shaped by hand with screeds and floats. Wood forms for the remaining parts of the battery and its appurtenances were built in place.

In executing its contract for Battery B, the T. J. Forschner Contracting Co. adopted steel forms for walls and hopper bottoms. These forms proved superior to the former methods. The present contractor continued the use of steel forms.

Battery C—When the S. A. Healy Co. received the contract for Battery C, it considered several methods of prosecuting the work, figuring the possibilities of belt conveyors and crawler cranes as alternatives to the cableway system of distribution. As no alternative scheme appeared to offer the same speed, flexibility and facility in handling concrete, forms, reinforcing steel and other materials over the entire area, the S. A. Healy Co. made arrangements to purchase the two tower cableways and the existing concrete plant.

Construction of Battery C requires 150,000 yd. of excavation and 72,000 yd. of concrete. Excavation started May 21, 1931. The battery must be ready for operation October 1, 1932. Slightly more than 16 months is actually available for construction of the battery and its appurtenances.

Design of Battery—Battery C consists of 36 Imhoff tanks, each 80 ft. square, with a maximum water depth of 37 ft. Dimensions of the battery are approximately 500x560 ft., inside to inside of walls. As indicated on the layout, the battery has three operating galleries, running north and south, and two east-and-west expansion joints. The galleries and joints separate the tanks into groups of two and four.

Each tank has two hopper bottoms extending east and west, and five cross-walls equally spaced across the hoppers. The cross-walls are not solid; they have large bottom openings over each hopper. Precast concrete baffles rest on the cross-walls.

Excavation—Soil at the site of Battery C is clay of excellent quality. Excavation has progressed at the rate of about one hopper per day. A first cut approximately 6 ft. deep, to the top of the hopper slopes (highest footing elevation), was excavated chiefly by a Bucyrus-Erie 1-yd. shovel. The contractor roughs out the hopper excavation with a 2¼-yd. Bucyrus steam dragline and finishes the machine ex-

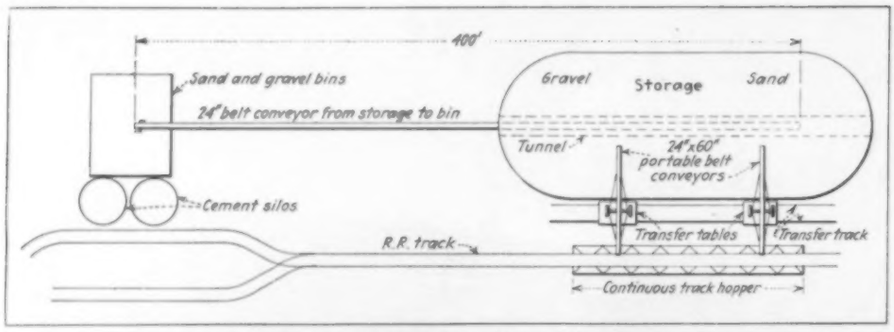


DIAGRAM OF AGGREGATE PLANT LAYOUT. Two transfer conveyors feed storage piles from track hopper. Long conveyor delivers aggregate from tunnel underneath piles to bins on mixing plant.

cavation to approximate line and grade with a Bucyrus 1½-yd. diesel dragline. Final trimming is performed by laborers with pneumatic spades.

All spoil is hauled an average distance of 1,200 ft. and is stored for later use as backfill. The contractor uses six Caterpillar tractors with Western-Athey 7-yd. wagons when the mud is sticky and nine trucks, in addition, when the soil is dry.

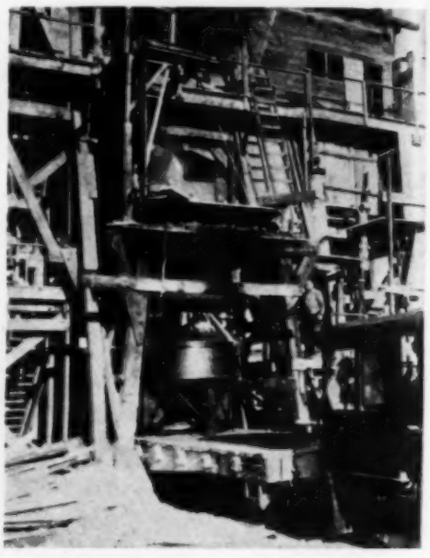
Traveling Cableways — The tower cableways are erected with the head towers on the north side of the battery and the tail towers on the south side. Both cableways use the same tracks and both have the same span, 775 ft. Towers of both the older and the newer cableway are of wood construction. The old towers are 115 ft. high and stand on platforms 50x110 ft. Height of the newer towers was made 135 ft. to facilitate handling of sectional steel forms over the tank walls.

Operation of the cableways is entirely electrical. Power is supplied to each cableway at the head tower through wheel trolleys in contact with a three-phase circuit. Movement of the head and tail tower of each cableway is synchronized by unit control of two Lidgerwood single drum hoists, one on each tower, driven by G.E. 60-hp. motors. The drum of each hoist has wound on it several turns of a continuous wire rope anchored to deadmen at both ends of the track.

Each cableway is operated by a main power unit consisting of a 300-hp. G.E. motor installed on the platform at the base of the head tower. This motor drives two drums, 4 ft. 6 in. in diameter, one for the ¾-in. load line and the other for the ⅞-in. conveyor cable. The track cable of each unit is 2¾-in. wire rope. Loads of 20 tons can be handled at any part of the span.

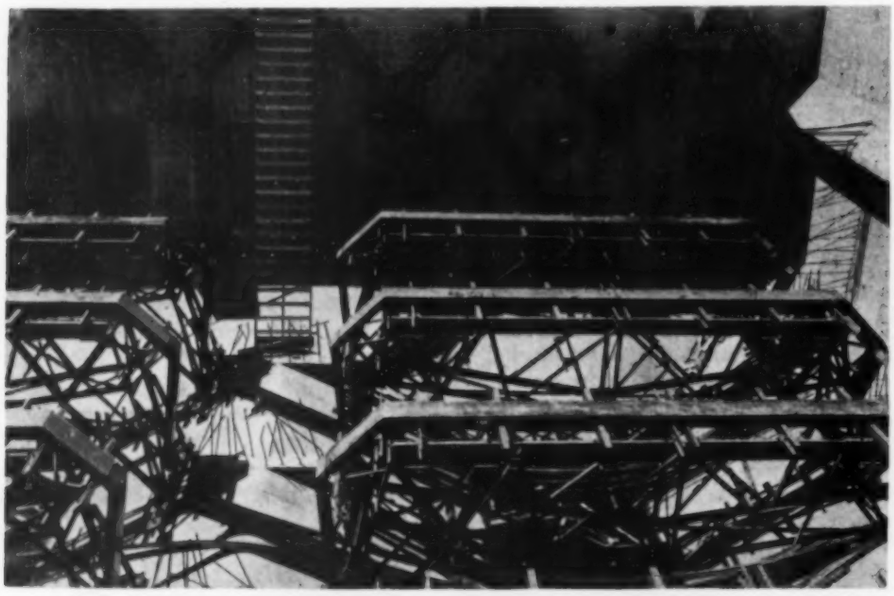
Construction Procedure — Construction started at the east side of the battery and is proceeding toward the west. The first operation is the excavating of the hoppers. As soon as the trimming of the hopper bottoms and footings has been completed, a 3-in. layer of concrete is placed to prevent the clay from being softened by rain. Reinforcing steel is set on the hard surface. The operating (north-and-south) walls are the first walls to be constructed, followed by the intermediate (east-and-west) walls and, finally, by the crosswalls.

It was originally intended to use the two cableways simultaneously, handling forms and placing concrete. In starting the work, however, it was necessary to use a day shift to set steel reinforcement and erect forms and a night shift to place concrete. Operation of a night shift proved so economical that the two-shift plan has been continued, leaving the cableways free during the day to move forms and unload and place reinforcing steel, pipe and miscellaneous parts. It is expected that, after completion of the larger pours (footings, bottoms, and operating gallery walls), concrete can be handled on the day shift.



7-YD. HOPPER under mixer discharges concrete into 7-yd. bucket on flat car.

Steel Forms—Main-wall forms are erected and concreted in sections 80 ft. long by 25 ft. high; but they are moved in sections 25 to 30 ft. long. Sufficient Blaw-Knox steel forms have been leased to keep form-setting one step in advance of concreting. These forms include one section 80 ft. long for the battered outside face of the east and west walls; two sections, each 80 ft. long, for inside faces of the east and west walls and for two sides of conduit walls (north-and-south walls between operating galleries); two sections 80 ft. long, one for the tank face of the operating gallery walls, and the other, with weir box forms attached, for inside of operating gallery wall; and two 80-ft. sections for both faces of the north wall, south wall and all intermediate walls except those at the expansion joints. The last-named forms serve for the tank faces of the expansion walls; special forms are used for the inside faces.



BRIDGES in position for bottoms of cross-wall forms. Each tank has five cross walls, and each cross-wall form requires two trussed bridges for openings over hoppers.

TRANSFER CONVEYOR is standard portable unit resting on movable truck. In background is inclined portion of 400-ft. belt delivering to bins on plant.

Bottom forms consist of one hopper form which extends to within about 15 ft. of the walls and 160 ft. of forms for this remaining 15-ft. space. The latter forms are so arranged that they can be set in several combinations 40 ft. long. In addition to these forms, the contractor has ten forms for the bottoms of cross walls 80 ft. long (each form comprising two "bridges") and five complete forms, 80 ft. in length, for both sides of cross-walls.

Concreting—Concrete is delivered to the cableways in 7-yd. Union Iron Works buckets, transported from the mixing plant on standard-gage flat cars. The average railway haul is about 1,300 ft. Two Baldwin steam locomotives, an 18-ton and a 25-ton, haul one bucket each. The 7-yd. buckets are carried to position over the forms by the cableways.

In pouring the hoppers, it is necessary to vibrate the forms to obtain a dense concrete with a smooth surface. The contractor utilizes the available air supply to vibrate the forms with pneumatic hammers. Numerous ¾-in. holes were burned in the steel hopper form to release air from beneath and to permit observation of the concrete. The form is vibrated until grout appears at each hole. This method proves highly successful.

To pour the main walls, 80 ft. long by 25 ft. high, concentrating spouts of various lengths are used. The first spout, 14 ft. long, places concrete to 2 ft. above the bottom of the spout. Pouring them is continued through spouts 8 ft. long, these being replaced by 4 ft. spouts as the filling progresses. The last 2 ft. of the pour is placed directly from the 7-yd. bucket.

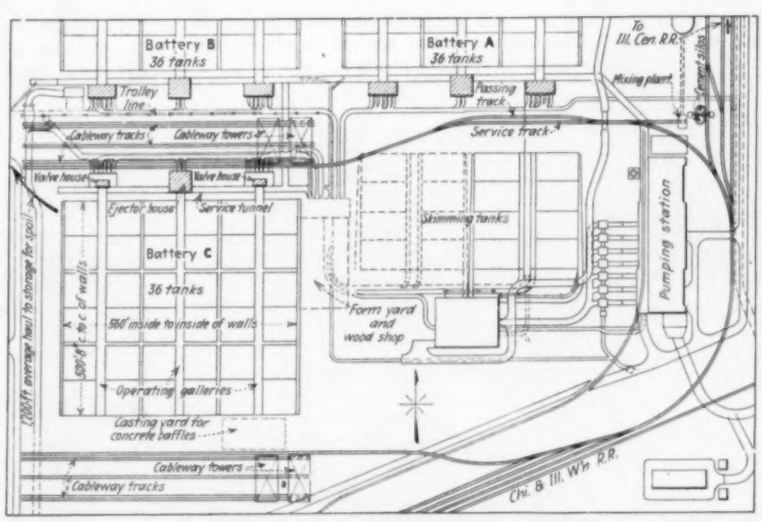
Concrete Plant—As indicated by the accompanying diagram and by one of the photographs, aggregates are dumped by railroad cars into track hoppers from which two portable 60-ft. Barber-Greene belt conveyors, resting on mobile flanged-wheel trucks, transfer the sand and stone to storage piles.

The storage piles feed a 24-in. Link-Belt conveyor, in a 240-ft. tunnel underneath, through gates electrically controlled from an observation house on the top of the mixing plant. This conveyor, 400 ft. long, elevates the materials to the bins at the top of the mixing plant.

Bulk cement is unloaded from railroad cars at the mixing plant and is stored in two wooden silos with a capacity of 1,600 bbl. each. A drag scraper unloads the cement into a boot from which a bucket elevator delivers it to the storage silos. From the storage silos, a screw conveyor feeds cement to a central bucket elevator which lifts it to a 125-bbl. bin on the same level with the aggregate bunkers. A second screw conveyor feeds cement from this bin to a weighing hopper on a platform scale equipped with an automatic electrical tripping device to regulate the feed. When the correct weight of cement is registered by the scale, a workman dumps the cement from the hopper into a screw conveyor provided with gates to charge any mixer as required. The cement-handling equipment, of Link-Belt manufacture, is capable of moving 375 bbl. an hour.

The mixing plant is a four-story tower, surmounted by a water tank and the control house for aggregate delivery. Under the aggregate bins, which occupy the fourth story, are the cement weighing apparatus, already described, and a Blaw-Knox volume stone batcher and sand inundator for each mixer. Below this proportioning floor are two Ransome 1-yd. mixers, ordinarily used on the present contract, and a Smith mixer of the same capacity, available for service in case of need. Each mixer discharges into a 7-yd. steel hopper. The hoppers charge the 7-yd. buckets on the railroad flat cars. All equipment of the mixing plant, including the aggregate conveyor, cement-handling apparatus, and mixers, is driven by G.E. electric motors.

Administration—Construction of the West Side Sewage Treatment Works is being carried out under the general direction of Edward J. Kelly, chief engineer of the Sanitary District of Chicago, and Philip Harrington, principal assistant chief engineer. L. B. Barker is principal construction engineer in charge of general plant construction, and Lee L. Bradish is assistant engineer in charge of field construction on this contract. For the S. A. Healy Co., Walter Duncan, chief engineer, and J. Voss, superintendent, direct operations.



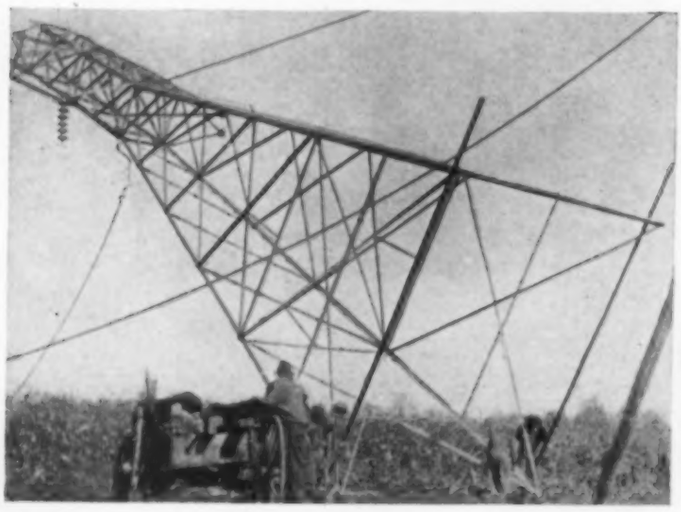
PLAN OF CONSTRUCTION LAYOUT. Contractor has approximately 2½ miles of service track on job interconnected with two railroads. Leads in front of towers enable cableways to unload and distribute materials.

Step-by-Step Field Methods
Erecting Transmission Line Tower

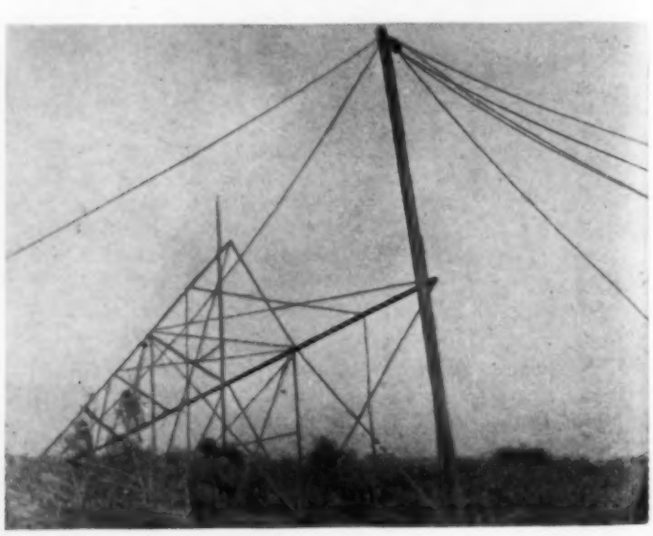
SUCCESSIVE stages in erecting tangent steel towers for a 66,000-volt transmission line 46 miles long between Jefferson City and Mexico, Mo., are illustrated herewith. The work was done by the Illinois Power & Light Corp., under the direction of B. G. Slining, superintendent, and R. H. Kenning, field superintendent. The tower illustrated is 62 ft. high and weighs 4,800 lb. In all, 285 towers were erected, with an average ruling span of 900 ft.

1 MATERIALS FOR TOWER 62 ft. high are delivered by motor truck. Assembly is done with tower prone where ground conditions permit. Each tower weighs 4,800 lb.

3 READY FOR RAISING. All steel has been bolted up and the tower lies horizontally on the ground ready to be hoisted to a vertical position.



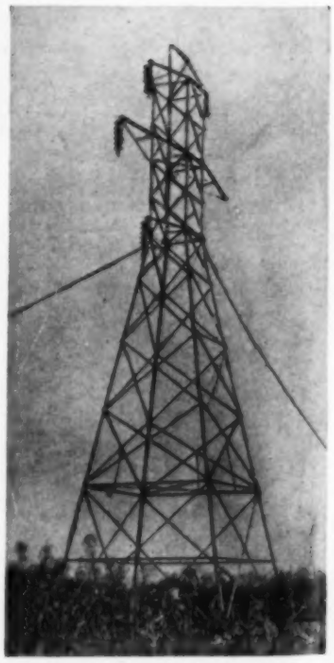
2 ASSEMBLY OF TOWER UNIT is done in about one hour's time by bolting steel members together at site where structure will be erected.



4 GIN POLE *(above)* is set up and securely guyed laterally. Cable from tower extends to gin pile. With block and cable from special hoist on Caterpillar tractor, gin pole is pulled back from vertical to horizontal position, up-ending the tower.

5 RAISING *(left)* the 4,800-lb. steel tower is completed in about 10 minutes.

6 TOWER ERECTION COMPLETED *(right)*. On the 46-mile transmission line 285 towers were raised by the method illustrated. The average span between towers is 900 ft.

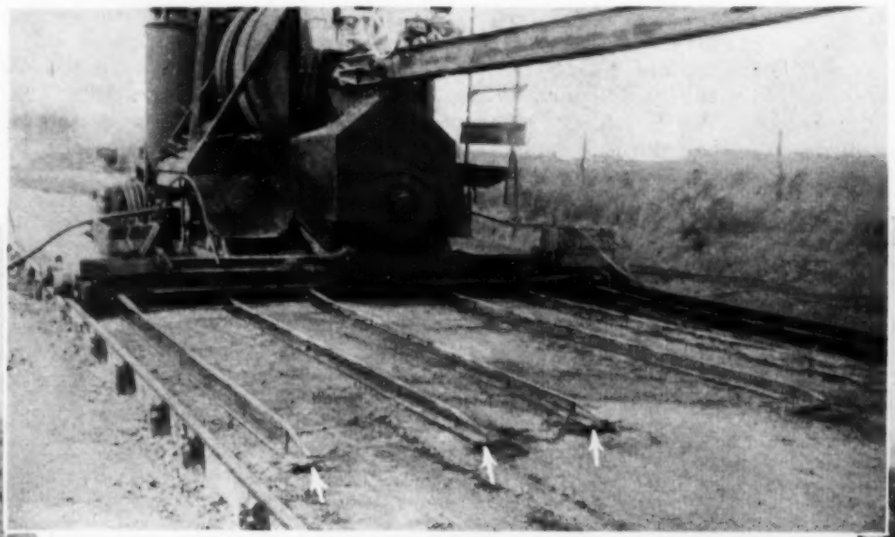


STEEL SLEDS *Support Reinforcement on* KANSAS PAVING JOB

BUILT-UP steel skids have been used with some success by the Roberts Construction Co., of Lincoln, Neb., to support wire-mesh reinforcement in concrete pavement construction for the Kansas highway department. On an 11½-mile job, between Newton and Burrton, on U. S. 50 S, E. C. Smith, Kansas manager for the Roberts Construction Co., experimented with six open-web sleds attached to the trail grader behind the mixer. Special precautions were taken to prevent the skids from forming planes of weakness in the concrete.

In addition to the steel sleds, the job offered several other features of interest. A permanent impression in the concrete surface was made for the center-line stripe. The concrete batch contained only one grading of aggregate, a mixture of fine and coarse. Transverse contraction joints in the pavement were cut with a knife-edge wheel. The contractor used a home-made plant to handle bulk cement. Water supply for a good part of the job was obtained by means of well-points.

Design of Road — The project included 11½ miles of 9-6-9-in. slab 18



STEEL SLEDS are attached to subgrade planer. Arrows indicate transverse blades which mix concrete as sleds are drawn through it.

F. P. DALE, resident engineer, in charge for state highway department.

D. N. PALMER, superintendent for Roberts Construction Co.

CONTRACTION JOINT is formed by working spade and wheel cutters through slot in wood templet.

ASPHALT PAINT is applied to roughened center stripe through opening in templet.

ROUGHENED CENTER STRIPE is marked permanently on pavement surface by pounding templet faced with wire mesh into soft concrete.

E. C. SMITH, manager of Kansas operations for Roberts Construction Co.

ft. wide, laid on sandy subgrade free from heavy grades and curves. To provide for expansion under hot summer suns, 1¼-in. joints were placed every 116 ft. Contraction joints (slots 2 in. deep) were cut at 29-ft. intervals between expansion joints. The slab was reinforced with 49-lb. welded wire mesh 2 in. below the surface. A crimped steel plate was installed in the slab on the center line.

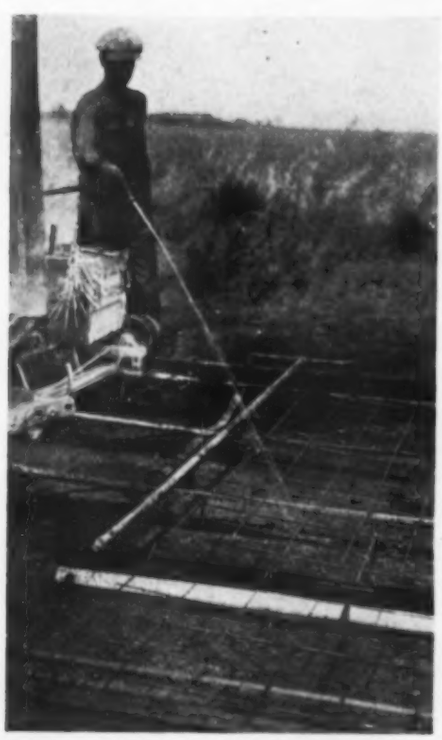
Grading—A Caterpillar 60-hp. tractor operating a Galion 12-ft. blade grader or a Killefer scarifier performed preliminary shaping of the subgrade. Final grading and rolling were accomplished by a Lakewood subgrader and an Acme 5-ton roller. A Carr formgrader cut the trenches for the steel road forms, 4,740 lin.ft. of which were used on the job.

Concreting — Dry materials were delivered to a Rex 27-E paver by single-batch trucks hauling under subcontract agreement. Behind the mixer trailed the steel sleds. The wire-mesh reinforcement was placed on the sleds before the mixer deposited any concrete on the subgrade. After the forms had been filled with concrete, the paver moved forward, pulling the sleds through the fresh concrete to the adjacent section of bare subgrade. An Ord machine finished the concrete surface. Progress averaged 115 to 120 ft. an hour.

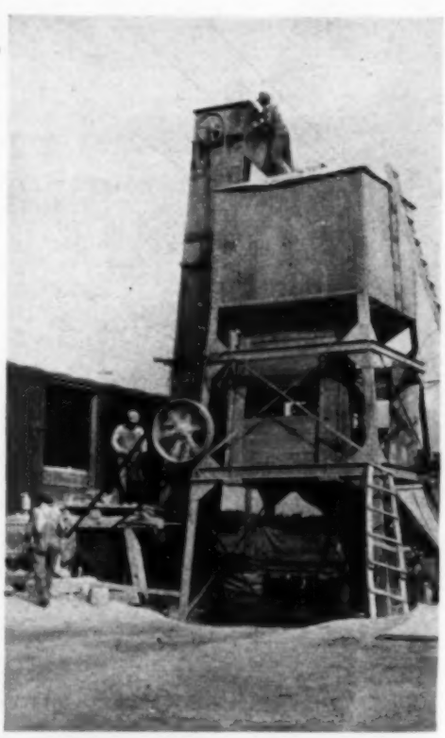
Steel Sleds—Each of the six steel sleds, 18 ft. in length, consisted of a runner 2½ in. wide on the bottom and a flat strip 1 in. wide on the top, with bolts welded between the top and bottom. The photographs illustrate this construction. Height of the sleds varied according to their position on the subgrade so that the mesh rested 2 in. below the concrete surface at all points.

At the rear end of each sled was a transverse blade 9 in. long, indicated in one of the photographs. The purpose of this blade was to mix and stir the concrete as the sled was drawn ahead, thus filling any voids caused by passage through the concrete. As an additional precaution, a workman tamped the concrete along the tracks of the six sleds after they had been drawn ahead.

Only one advantage could be claimed for the sleds. They definitely placed the reinforcement at the designed position in the slab. No time was saved over methods which required striking off the first layer of concrete to place the mesh. Labor may have been somewhat less. The sleds tended to collect concrete, forming solid masses which seemed likely to open appreciable gaps



WIRE MESH is placed on steel sleds before mixer deposits any concrete. Templet, with T-head fitting on road form, determines position of steel-plate center strip.



BULK CEMENT PLANT made by contractor has belt-driven bucket elevator, steel bins, and weighing hopper.

in the slab. Mixing by the blade and tamping appeared to close all voids.

Joints — Expansion joints were formed by placing 1¾-in. wood bulkheads in the concrete. Workmen removed the bulkheads on the following day and poured the joints with hot asphalt.

To form a contraction joint, after the concrete had taken its initial set, the finishers laid a slotted wooden templet across the slab and opened a groove to the depth of the wire mesh with a wheel cutter, shown in one of the photographs. One finisher preceded the wheel with a spade cutter which he pushed down below the mesh, separating the aggregate and aiding the future break. The wheel cutter could be used on this job because the concrete aggregate was not coarse.

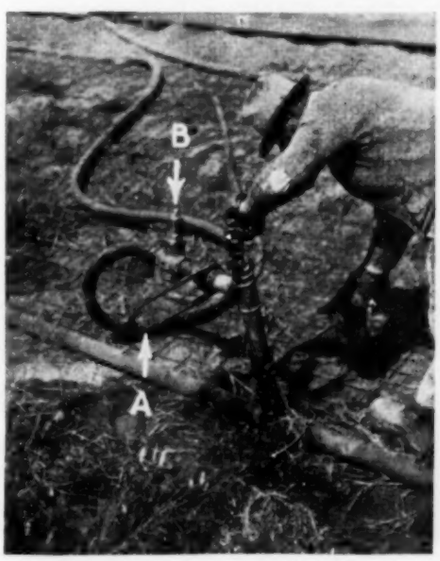
TAMPING CONCRETE along path of each sled assures consolidation and filling of voids.

O. D. McGEORGE *(left)*, foreman of materials plant, and R. E. NISSEN, timekeeper.

Water Supply — For 6½ miles of paving, the contractor obtained water from the groundwater table, 16 to 18 ft. below the surface, by using well-points and C. H. & E. triplex pumps. The sandy soil made the method practicable. At the hose connection to the pipe, the contractor eliminated need for a wrench by welding a handle to the pipe union. An adjustable reducing valve regulated pressure to the mixer.

Impressed Center Stripe—A permanent roughened center stripe was formed in the pavement surface by hammering a marking templet 15 ft. long by 3¾ in. wide into the soft concrete. The bottom of the templet was covered with two matched plies of ½-in. wire mesh. A workman walked the length of the templet, pounding the mesh into the concrete. When the templet was removed, it left a slightly depressed strip marked by shallow grooves in two directions. No concrete was picked up by the wire mesh. To complete the center-line stripe, on the following day, a templet having an opening 16 ft. long by 3¾ in. wide was placed over the depression, and a workman covered the roughened surface with asphalt paint.

An advantage of the impressed stripe is that it assures a straight traffic mark which is plainly visible at night. Compaction of the concrete above the steel-plate center strip is also said to produce a straighter crack later on.



WATER-HOSE CONNECTION is made quickly with pipe union having handle (A) welded to it. Reducing valve (B) regulates pressure to mixer.

Concrete Aggregate—Lack of an available supply of coarse gravel caused the highway engineers to use only one grading of aggregate, an Arkansas River sand and gravel with a fineness modulus of 3.81 to 4.10. The concrete mix was 1:3½.

Material Handling—The material-handling plant was located on an electric interurban line, 1 mile from the center of the job. A Bucyrus-Erie steam crane unloaded aggregate from railroad cars with a 1-yd. clamshell bucket, charging Blaw-Knox 70-ton steel bins and storing extra material in a stock pile. Aggregate was weighed in a Blaw-Knox batcher which discharged into the single-batch trucks.

After taking on its load of aggregate, each truck drove under the cement plant to receive a weighed quantity of bulk cement, which was dumped on top of the aggregate. A tarpaulin cover was drawn over the top of the truck body to prevent the cement from blowing away.

FRED S. CLAUS *(left)*, slab inspector, and R. M. DALE, subgrade inspector.

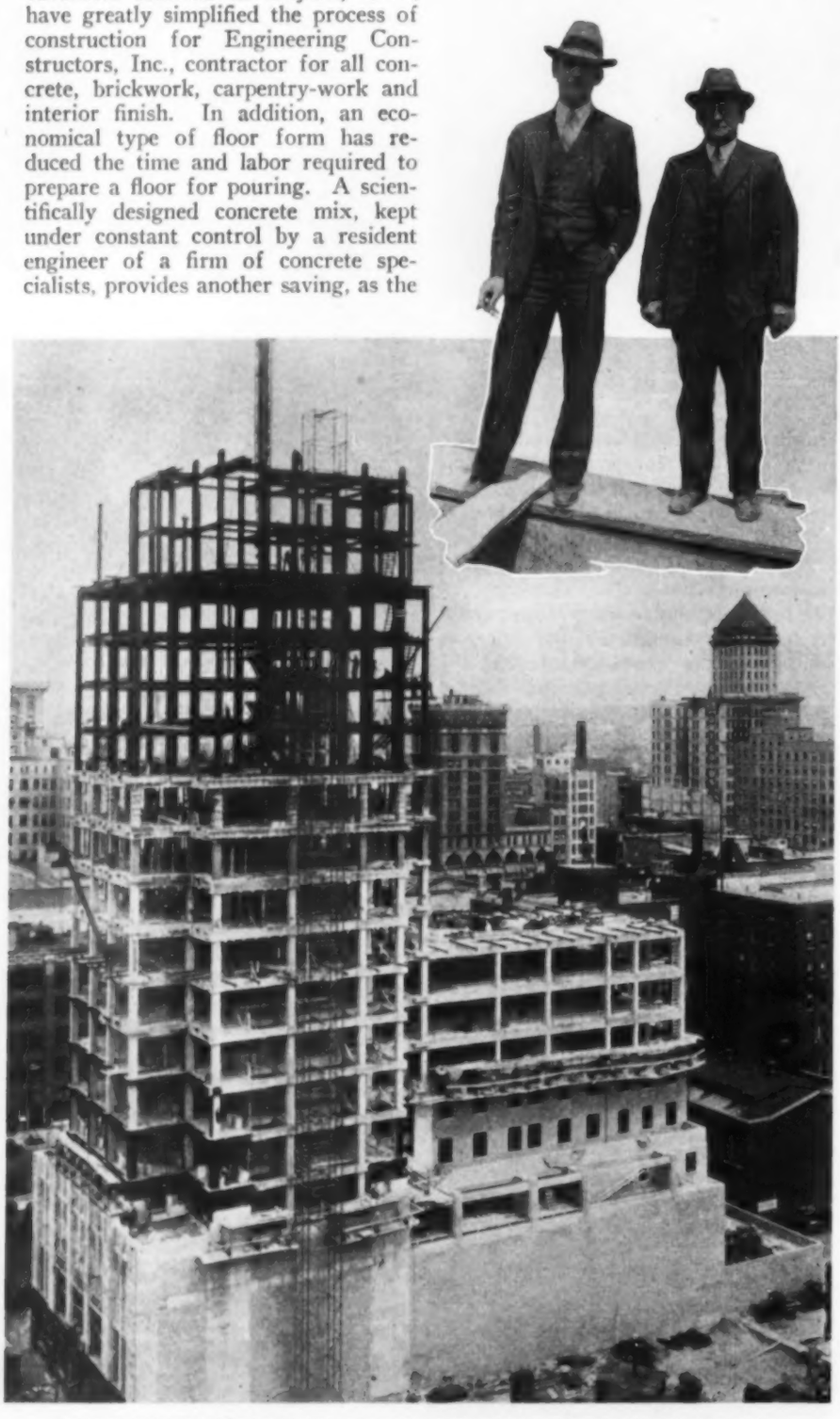
The contractor's bulk-cement plant, shown in one of the illustrations, was equipped with a bucket elevator, 700-cu.ft. bins, and a Johnson weighing batcher. Cement discharged from the batcher to the truck through a canvas spout.

Management—For the state highway department, F. P. Dale was resident engineer. D. N. Palmer, superintendent, directed operations for the Roberts Construction Co., acting under E. C. Smith, of Wichita, Kansas manager.

MODERNIZED MATERIAL-

Facilitate Construction

EFFICIENT methods of elevating and distributing materials on a twenty-story bank and office building, situated in an unusually favorable location in Dayton, Ohio, have greatly simplified the process of construction for Engineering Constructors, Inc., contractor for all concrete, brickwork, carpentry-work and interior finish. In addition, an economical type of floor form has reduced the time and labor required to prepare a floor for pouring. A scientifically designed concrete mix, kept under constant control by a resident engineer of a firm of concrete specialists, provides another saving, as the mix is adjusted to produce concrete of predetermined strength, allowing forms to be stripped at a specified time.



20-STORY BUILDING UNDER CONSTRUCTION, with outside tubular hoist tower for concrete. Stone setters and bricklayers work on suspended scaffolds. A. W. KIMMEL *(left, above)*, president, Engineering Constructors, Inc.; and WILLIAM BUETER, superintendent of job for Schenck & Williams until his death on July 5, 1931.

Separate contracts were let by Schenck & Williams, architects of the building for the owner, the Mutual Home & Savings Association. The firm of Schenck & Williams is well equipped to manage work on this basis, and the principal contractor, Engineering Constructors, Inc., received such effective cooperation in prosecuting its work that A. W. Kimmel, president, expresses himself as better pleased with a separate than a general contract under these ideal conditions.

Design of Building—The Mutual Home & Savings Association building is a steel-frame structure with a twenty-story tower fronting on Second St., and an extension at the rear seven stories high. Dimensions of the rectangular ground floor plan are 80 ft. on Second St. by 198 ft. 9½ in. deep. A setback at the rear on the mezzanine floor reduces the length of the building to 163 ft. This length continues to the eighth floor, from which the tower rises above the rear portion of the building. The tower is approximately square, 80x80 ft., with set-in corners, as indicated on the plot plan.

A banking room 60 ft. wide by 160 ft. long and 34½ ft. high occupies the ground floor of the building. Shafts for four elevators had to be provided along one side of this banking room. The architect's engineer designed five fixed frames made up of legs composed of two braced columns each and deep girders at top and bottom to carry the tower. Four trusses support the seven floors above the rear end of the banking room. Side walls of the building are suspended from the cantilevered ends of the girders and trusses, which extend approximately 10 ft. beyond the inner supporting columns. An almost equal loading on each half of the girder span made it possible to cut openings for a corridor through the centers of the webs of the girders.

Concrete Foundation Mat—Resting on water-bearing gravel which extends, according to the geologists, 600 ft. to bedrock, the only practical foundations for the building were spread footings. Where the spread footings became large, under the tower, the architects' engineer designed a single mat, which

HANDLING METHODS
of 20-Story Building

will prevent unequal settlement. The eight-story rear portion of the building rests on ordinary spread footings.

The finished basement floor is approximately 10 ft. below the average water table. At the time of construction, because of the drought, the water table was much lower. Two Moretrench 6-in. pumps, operating batteries of Moretrench well-points spaced 6 ft. apart, lowered the water level 5 to 10 ft. below the bottom of the excavation.

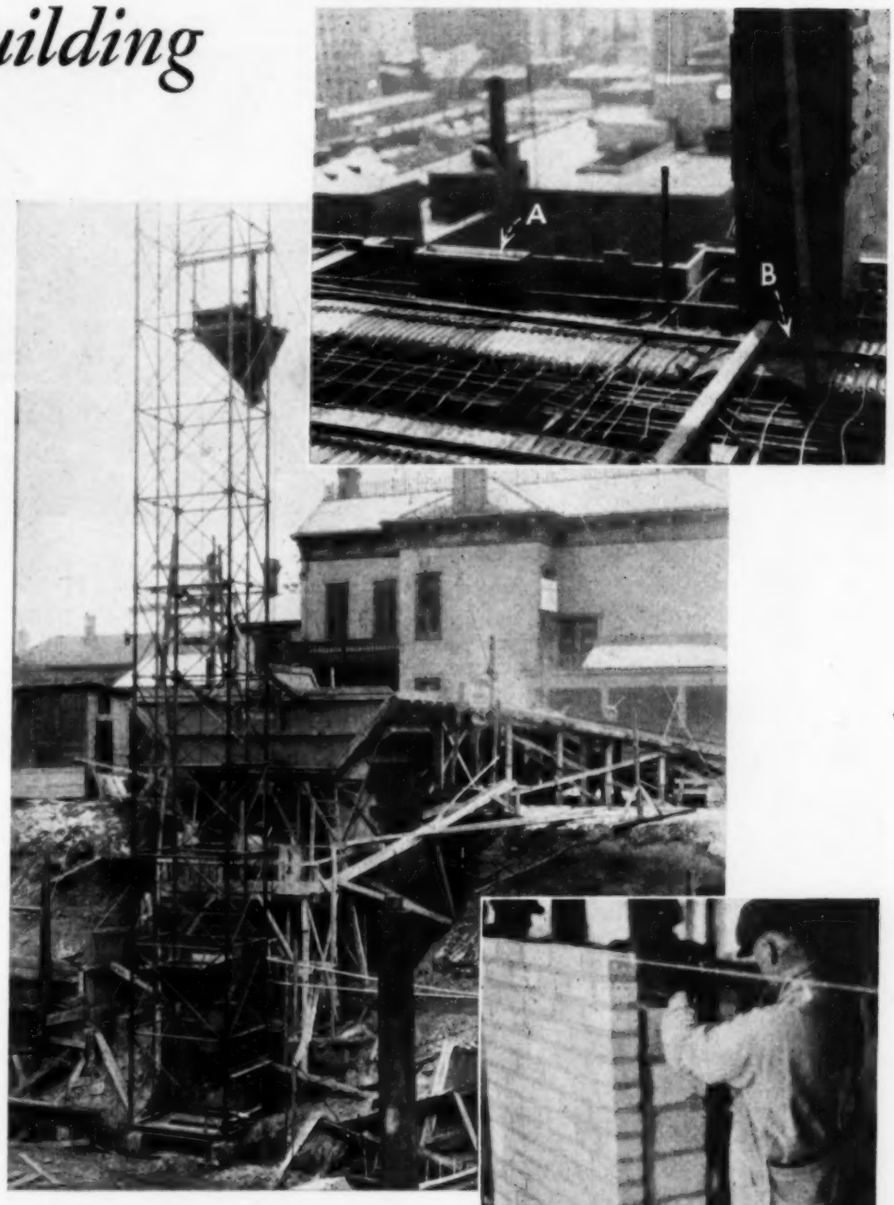
In preparation for pouring the mat, the foundation contractor put down a 4-in. concrete slab to support the forms and reinforcing steel. The foundation mat, 4 ft. thick, was reinforced at top and bottom with steel bars. A framework of 4x12-in. timbers, resting on angle-iron columns left in place, carried the top reinforcing on hangers and supported the buggy runways.

The mat was divided into three sections, with joints at points of no shear. Each section contained about 400 yd. of concrete, which had to be placed in a continuous pour.

For purposes of waterproofing, the foundation walls are tied into the mat. Under the rear portion of the building, where spread footings were used, a waterproofing mat 1 ft. thick was put down to resist the upward pressure of the water. Hydrolithic cement waterproofing was applied to the foundation mat and walls.

To provide space for girders and drainage pipe under the sub-basement floor, Engineering Constructors, Inc., placed 14 in. of gravel fill on top of the mat and constructed a 4-in. concrete slab for the sub-basement wearing surface. The gravel sub-base drains to a sump. In case of a break, all leakage will be ejected by an automatic sump pump.

Steel Erection—To erect the five complete frames supporting the tower, the John G. Pool Co., of Dayton, contractor for the steel erection, used two steel stiff-leg derricks set on the foundation mat—a 40-ton derrick with an 85-ft. boom, operated by a two-drum Mundy steam hoist, and a 50-ton rig with a 90-ft. boom, powered by a three-drum Lidgerwood steam engine. Both hoist boilers were fired with coke. Three moves of the stiff-leg derricks sufficed to place the ten 80-ft. girders, weighing from 72 to 83 tons each, and the ten columns, 48 ft. long, in the five frames.



CONCRETE PLANT outside building line is erected with mixer at basement level. Trucks climb ramp to dump aggregates into bins. SPECIAL FITTING *(indicated by B, above)* connects air duct across floor beam. Air outlet *(A)* is installed in wall under window.

A 10-ton steel guy derrick, with 95-ft. mast and 85-ft. boom, operated by an American two-drum steam hoist, erected the eight stories at the rear of the building, and, then, was rolled forward to complete the erection of the tower above the banking room.

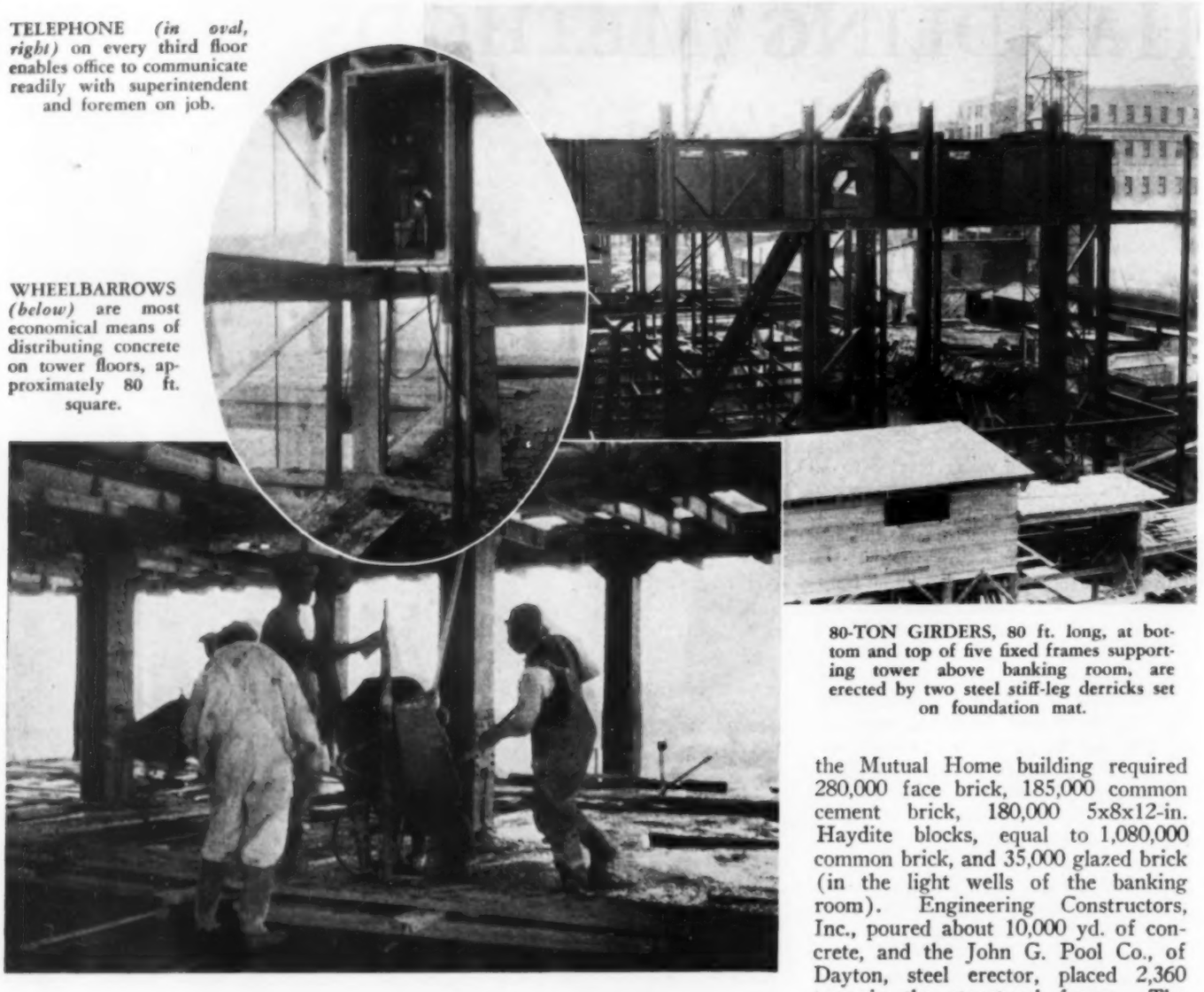
Material Handling—The exceptionally open location of the building simplified the delivery and handling of materials. Automobile parking lots flanked the building on both sides. Engineering Constructors, Inc., rented a 20-ft. right-of-way on the east side and a 45-ft. strip on the west, placing the concrete plant on the latter right-of-way, outside the building. Structural steel was taken up on the east side of the structure, and reinforcing steel, forms, shores, lumber, and floor pans were raised by a Chicago boom on the west.

TYPICAL BRICK WALL of building, with face brick backed up by Haydite blocks.

Trucks had access to the building

TELEPHONE *(in oval, right)* on every third floor enables office to communicate readily with superintendent and foremen on job.

WHEELBARROWS *(below)* are most economical means of distributing concrete on tower floors, approximately 80 ft. square.



80-TON GIRDERS, 80 ft. long, at bottom and top of five fixed frames supporting tower above banking room, are erected by two steel stiff-leg derricks set on foundation mat.

through two entrances, one at the front, into the banking room, and a second from the alley at the rear. The rear entrance was a permanent opening leading to an automobile parking garage in the basement and sub-basement.

Materials were purchased in carload lots and were unloaded at the freight yard into hired trucks which delivered them inside the building. A hoist in one of the permanent shafts elevated brick, blocks and mortar used in the tower, and a tubular tower at the rear of the building extending through the roof at the mezzanine floor setback, delivered materials to the eight-story portion of the structure.

Brick and blocks were unloaded from the trucks on to the floor or on to skid platforms. The number of platforms on the job, 24, was not sufficient to permit all brick and blocks to be loaded on to them. Brick and blocks stored on the floor were transferred to platforms to be taken to the upper stories. Four Barrett lift-trucks moved the loaded platforms on to the hoist cage and from the cage to the designated point on the upper floor. The materials were rehandled on this floor, being removed from the platform and stacked for later use.

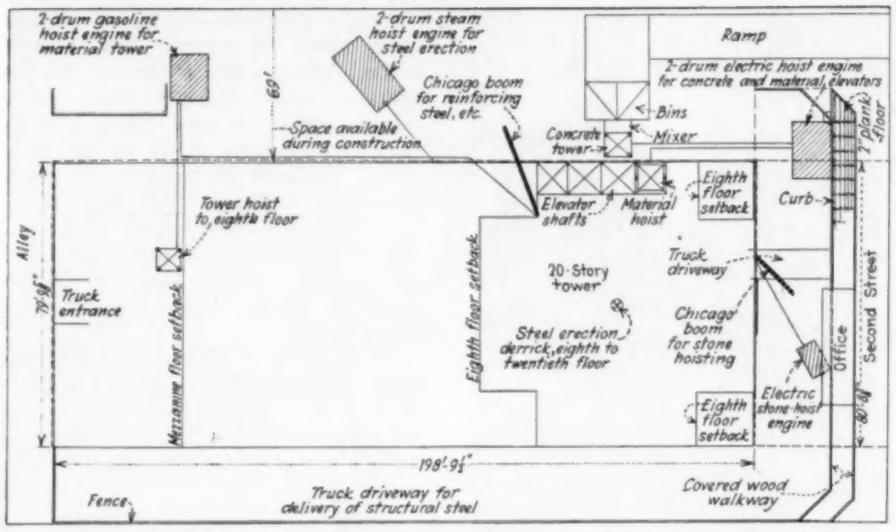
As actually used on the job, the platforms and hand trucks were of advantage in reducing the labor of transporting blocks from the unloading point to the floors above. The greatest saving occurred when the platform could be loaded directly from the truck and unloaded at the point where the brick and blocks were to be used.

Rubbish Disposal—All rubbish was transported to the ground floor in boxes which were dumped into the contractor's hired trucks. The trucks disposed of the rubbish on their return trip to the railroad freight yard. A boxful of rubbish made a load for one truck. The platforms transported these boxes to the ground floor on the down trips.

Material Quantities—The walls of the Mutual Home building required 280,000 face brick, 185,000 common cement brick, 180,000 5x8x12-in. Haydite blocks, equal to 1,080,000 common brick, and 35,000 glazed brick (in the light wells of the banking room). Engineering Constructors, Inc., poured about 10,000 yd. of concrete, and the John G. Pool Co., of Dayton, steel erector, placed 2,360 tons in the structural frame. The tower is faced on four sides with 26,000 cu.ft. of Bedford limestone. In addition, the first floor front has a facing of black granite. The Winfrey-Wilson Co., Shreveport, La., set all the stone.

Floor Design Determines Heating System—By using Goldsmith (Cincinnati) domes for the arches between the reinforced-concrete floor joists and Goldsmith metal lath for the ceilings, Schenck & Williams were able to provide an economical air heating system, with humidity control. The plastered ceiling makes an airtight joint with the Goldsmith domes, thus providing an airtight duct through the sheet-metal archway. A special Goldsmith metal fitting, illustrated by one of the photographs, connects the air duct across floor beams where necessary. Air outlets are installed flush with the wall under the windows.

Primary units of heating and humidifying system are placed on the first, third and eighth floors, with a secondary control unit on each floor. The only steam piping required is the



PLAN OF CONSTRUCTION PLANT LAYOUT. Ample space around building and truck entrances on ground floor facilitate delivery of materials.

riser in the main service shaft. Cooling is effected by use of water from the building's own well, instead of by refrigeration, as is usually the case. In cold weather, water at a temperature 4 deg. above that of the air is employed to humidify at a controlled rate. The system changes and washes the air six times an hour. Each office is equipped with an automatic device for controlling temperature and humidity.

Galvanized metal ducts under the floors of the corridors carry the air from the secondary heating units to connections with the metal arches. Between the corridors and the walls, the air travels through the domes between the floor joists. The corridors are used as return air ducts, the used air being drawn down the shaft by fans. Fresh air is added as needed to replace leakage.

The air heating system reduces the cost of steam consumption roughly 55 per cent over direct radiation. Installation of the system on the Mutual Home building was made economically practical by the use of the Goldsmith domes and metal lath, which practically halved the sheet-metal work. A decided advantage of the system is its flexibility in operation, which provides unlimited facility in arranging office space.

Floor Forms—Beam bottoms were suspended from the bottom flanges of the steel beams by Dayton sure-grip beam hangers. Goldsmith form joists, with a sheet-metal extension adjustable to 12-in. variation in length, were supported on the beam sides and tacked in place with double-headed nails. These joists supported the Goldsmith metal lath and domes and the reinforcing steel during erection. Before any concrete was placed, the joists were shored at the center of the span from the floor beneath by adjustable Atlas shores.

Column forms were locked in position with Symon's clamps. To recondition wood forms during construction of the building, a Rex table saw was installed in the structure and was moved up from floor to floor as the work progressed.

Concrete Control—Economy and efficiency in the proportioning of the mix, to obtain concrete of any desired strength, were obtained through the agency of a resident concrete specialist who kept a constant check on the grading and moisture content of materials delivered to the job. Engineering Constructors, Inc., contracted with E. A. Hagy, of Cincinnati, concrete consulting engineer, to perform this service. One of the members of Mr. Hagy's organization was placed on the job to keep the concrete mix under

CLOSING END OF METAL DOME *(right)*, where plans call for opening in floor.

CORRUGATED METAL DOME fits between upturned edges of metal lath. This construction results in airtight joint when ceiling is plastered and permits metal archways to be used as air ducts.

METAL LATH *(left)* is installed on form joists. Forming of floors proceeds rapidly in series of three operations: (1) Erecting beam forms and form joists, (2) Installing lath and (3) Placing domes.

accurate control. Design of the mix was determined by the Hagy system, a method based on that of Abrams and others. The architect's engineer was entirely satisfied with the result obtained by this method, and the contractor considered the service indispensable for efficient concrete batching and design.

Concrete Plant—The mixing plant and concrete hoisting tower were placed along the west wall of the building on the 45-ft. right-of-way. To make possible the deliveries of sand and gravel by a ramp, from which the trucks dumped directly into the bins, the mixer was placed 18 ft. below the surface of the ground, approximately at basement level. This arrangement permitted early erection of the concrete plant, which would have been impossible inside the building, and eliminated the cost of rehandling sand and gravel into the bins. The plant was equipped with Johnson 76-yd. bins, a Johnson weight batcher for gravel and Hydrogravic batcher for sand, a Rex 1-yd. mixer, driven by electric motor, and an American tubular steel tower extending to the full height of the building.

A Clyde two-drum 75-hp. electric hoist operated the 1-yd. concrete bucket in the tower and, also, the brick and mortar cage in the elevator shaft on the inside of the building's west wall.

Progress in concreting averaged one floor every 4 days. The sixth, seventh and eighth floors, requiring about 315 yd. each, were poured in one week. Hand buggies were used to distribute concrete on the first eight floors. Above the eighth floor, where the quantity of concrete amounted to about 180 yd. per floor, wheelbarrows proved more economical. On the larger floors the speed of concreting was 40 yd. an hour; this speed was reduced to 30 yd. an hour on the tower floors. Two Stanley Ajax electric hammers vibrated the forms on beams, columns, walls and flat slabs.

A. C. HEITMAN *(left)*, vice-president and general superintendent, John G. Pool Co.; and E. W. MOEHLE, structural steel inspector, Schenck & Williams.

Safety Devices—All hoist signals were given by electric bell. Hoist cables, between the hoistways and the engines, were covered with heavy plank guards. A wire screen extending from the floor to the ceiling completely enclosed the material hoistway inside the building. All floor openings, including stair wells, were protected by substantial hand rails and toe boards. Floor openings which could be closed were covered with heavy planks.

A telephone system between the office and the building proved a great time-saver. A telephone was placed on every third floor, and a system of signals was established to summon men to the 'phone.

Daily Operations—A schedule of operations in progress on April 30 indicates the general job organization:

Erecting steel on 17th floor, with guy derrick set up on 16th;

Installing beam and joist forms and metal domes on 12th floor;

Pouring concrete on 11;

Finishing wrecking of forms on 8;

Reconditioning forms to be taken up to 13 with power saw on 7;

Laying brick, 4 to 5;

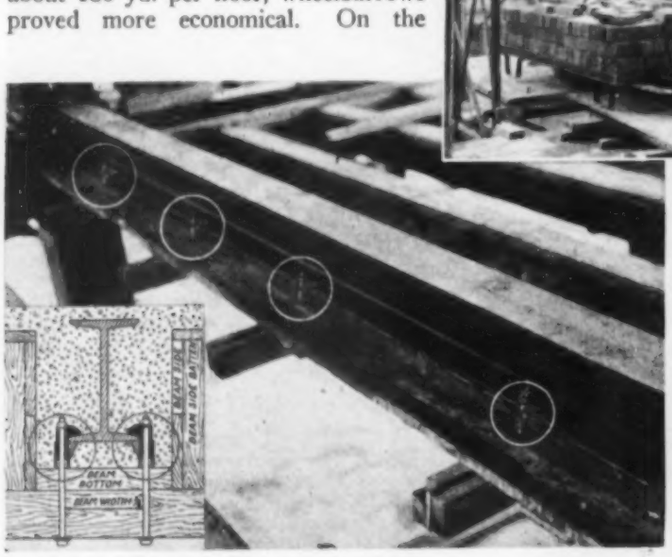
Setting stone on 3 and 4;

Laying glazed brick in bank-room light wells;

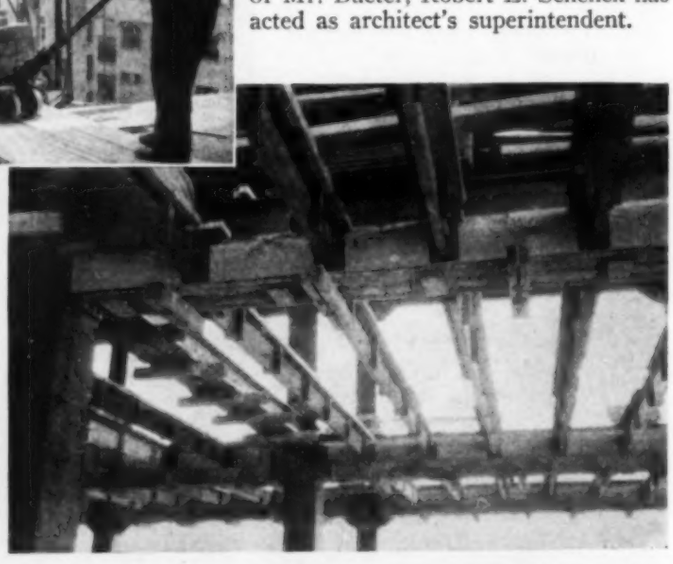
Placing reinforcing steel in ramp in sub-basement;

Mixing mortar in basement.

Supervision—In charge of operations for Engineering Constructors, Inc., were A. W. Kimmel, president, and Fred DeVoe, job superintendent. Up to the time of his death, July 5, 1931, William Bueter was superintendent for the architects, Schenck & Williams, of Dayton. Since the death of Mr. Bueter, Robert E. Schenck has acted as architect's superintendent.



BEAM HANGERS, attached to bottom flange of steel beam, support beam bottom battens. Spreader between beam and beam bottom provides for 2 in. of fireproofing concrete.



LIFT TRUCK *(above)* transports skid platform loaded with cement brick from ground floor to point where brick will be laid.

FORM JOISTS have adjustable metal ends which rest on, and permit nailing to, beam side, thus eliminating need for placing beam bottom battens under all joists.

AUGER *Bores Path for* UNDERGROUND CABLE

IN carrying out a program of removing unsightly overhead electric wires and placing them underground, the town of Salem, Ohio, avoided to a considerable extent the necessity of tearing up street and sidewalk paving, and destroying private driveways and lawns by the use of a mechanically driven earth auger. This tool, a local product made by the Salem Tool Co., consists of a compressed air motor which rotates a line of auger sections coupled together in 6-ft. lengths to produce a 2-in. bore of the desired length. The motor is driven by air delivered through a length of hose from a Davey air-cooled portable compressor, mounted on a motor truck.

After the bore has been completed, a cylindrical spreader, to which the electric cable is made fast, is attached to the end of the auger which is backed out of the hole, pulling the cable along with it. Holes 68 ft. long have been bored by this method under wide streets without the damage to the paved surface which would have resulted from digging trenches. The work has been done under the supervision of Service Director Clyde Reich.

The accompanying photographs illustrate the methods employed for placing the electric wires underground and show details of the air-driven auger, with its spreader attachment. The boring tool, with motor, weighs about 80 lb. and is handled by one man. Along curb lines some open trenching was necessary.

PORTABLE COMPRESSOR, in background, supplies air to manually controlled motor, weighing 80 lb., which rotates auger made up of 6-ft. sections coupled together. This hole, 15 ft. long under sidewalk, was bored in 10 min.

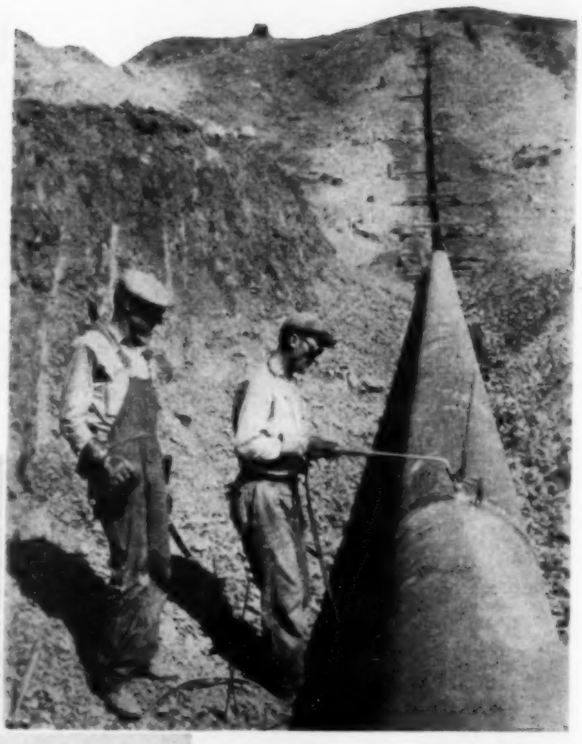
STREET SURFACE *(above)* remains intact as auger bores 2-in. diameter hole for electric cables under paving 60 ft. wide. **SPREADER** *(left)* reams hole to 2-in. diameter as auger is withdrawn pulling cable through bore

ELECTRIC CABLE is pulled through as auger is backed out of 2-in. bore. Spreader on end of auger enlarges hole and serves as connection with cable

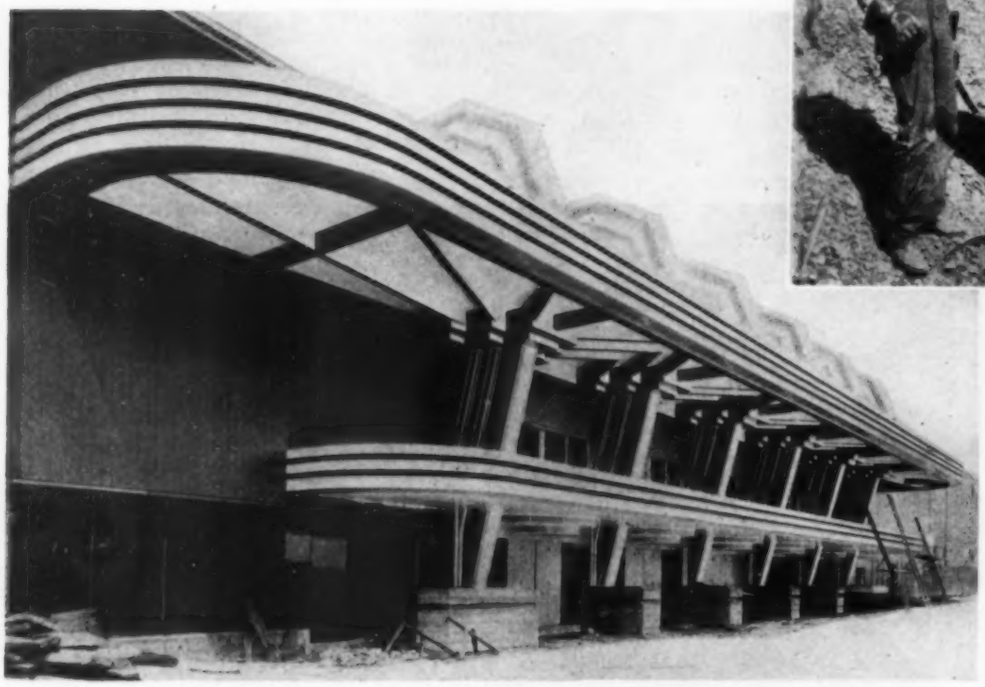
TRENCHING is resorted to along curb. Backfilling is done by blade grader with steel plate attachment which rides on top of curb

Getting Down to DETAILS

Close-up Shots of
Job Methods and Equipment



NEW OXY-ACETYLENE METHOD increases speed and efficiency of gas welding of pipe-line joints. Lindewelder, supported by two runners resting on top of pipe, consists of two-flame blowpipe and gravity-feed holder for special welding rod. New process enables operator to make 18 welds per 9-hour day on 24- and 26-in. pipe and 22 to 26 welds on 20-in. pipe, more than tripling speed of former oxyacetylene methods.



NEW STYLES *(left)* in architectural design have been applied to the canopied entrance of the Travel and Transport Building for Chicago's Century of Progress exposition next year. Upper canopy is 183 ft. long.

"SILVER" BRIDGE. Ohio state highway department, aiming toward attractive appearance and visibility, has adopted policy of painting all new steel bridges with aluminum. First coat is red lead, followed by two coats of aluminum paint. Bridge illustrated is 16-ft. through-truss span near Utica, Ohio.

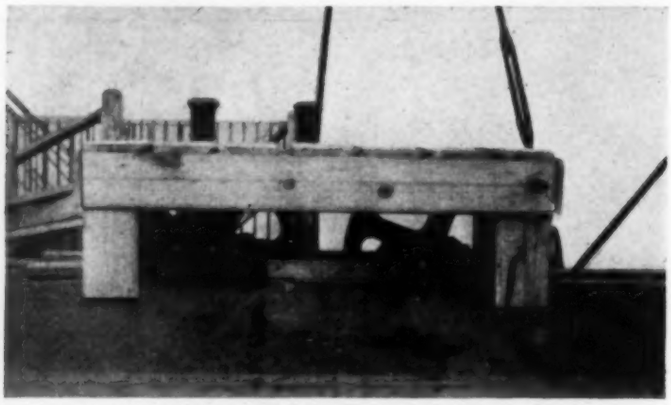
TRACTOR-HAULED SCRAPER *(above)* of new type has been developed by List Construction Co., of Kansas City, Mo. Pan has capacity of 4 cu.yd. On city street grading job illustrated, two scrapers, hauled in tandem by Caterpillar tractor, moved 5,000 cu.yd. of earth in 98 tractor hours, average haul being 300 ft.

PIPE INSPECTOR'S BUGGY *(above and at right)* designed by M. C. Kinder, division engineer, Mahoning Valley Sanitary District, Youngstown, Ohio, enables workmen to travel rapidly through 36-in. and 48-in. water mains. Rubber-tired ball-bearing wheels are mounted radially on axles to run normal to pipe invert. Storage battery and electric lamp supply light. Sanitary District built twelve buggies for inspectors, and Penstock Construction Co., of Sharon, made 30 for use of workmen in laying 25 miles of mains.

GIANT BUCKET EXCAVATOR, running on five lines of rails, digs canal and builds levee in Macedonia for Ulen & Co., American contractors. This Luebecker machine, made in Germany and powered by a 350-hp. Diesel engine, has a length of 249 ft. from end of 85-ft. bucket ladder to end of 148-ft. conveyor.

Safety Suggestions for

STOP CLEATS nailed to platform prevent movement of wheelbarrows while hoist is in operation.

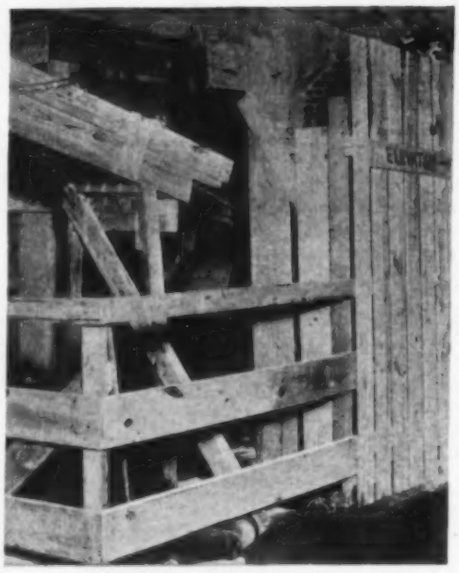


PROTECTION for head sheaves of a platform hoist when located near a floor level.

AS a result of study of the best systems in use by contractors in the principal cities of the United States, the Building Trades Employers' Association of the City of New York, through its accident prevention committee, has issued safety suggestions for the protection of workmen on material platform hoists. The report, reproduced in part below, is the work of a sub-committee headed by D. H. Dixon, Turner Construction Co., chairman. The recommendations in the bulletin supplement the Labor Law of the State of New York and the rules relative to the erection, repair or demolition of buildings.

As a protection for the men against falling objects the car of a platform hoist should be entirely covered either with a solid covering or a netting of No. 16 gage steel wire with a mesh which will reject a $\frac{3}{4}$-in. ball. Sections of the cover may be arranged to swing upward for the handling of bulky material, lengths of pipe, lumber, etc.

The car platform should be of sufficient size so that wheelbarrow handles will not project over the edge. It should be provided with cleats to prevent the movement of wheelbarrows while the car is being operated. In some cases on small platforms it has been necessary to saw the handles of the wheelbarrows off short to prevent fouling.

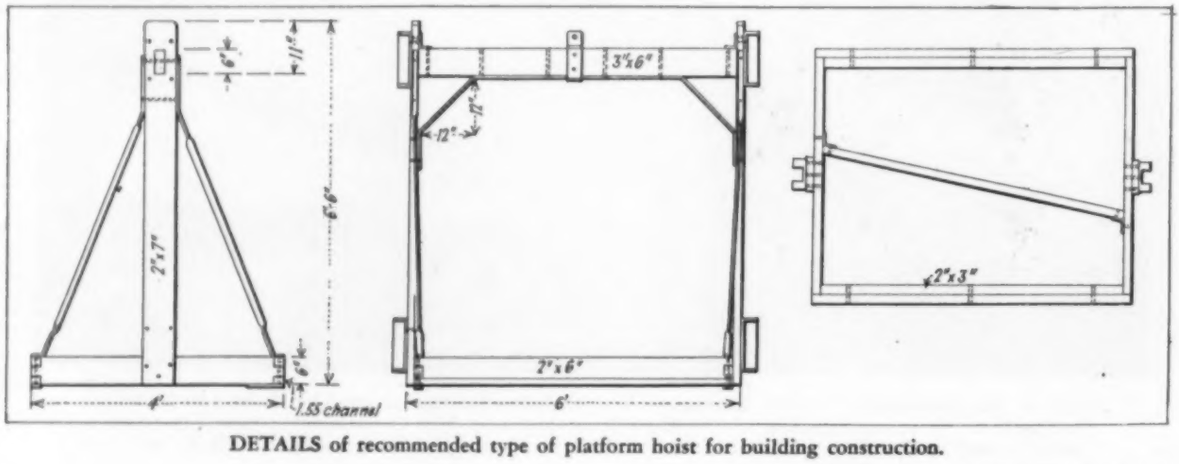


HOISTING CABLE IS ENCLOSED by wooden guard and hoist engine is fenced in.

Warning signs should be posted prohibiting anyone from riding any platform hoist carrying material except those which are properly enclosed according to the law governing hoists carrying passengers. Men who ride and engineers who allow riding should be disciplined.

All dangerous moving parts of machinery should, when practicable, be adequately guarded. All hoist cables exposed to contact should be adequately guarded. When machines are located near passageways or aisles where workmen pass they should be properly fenced.

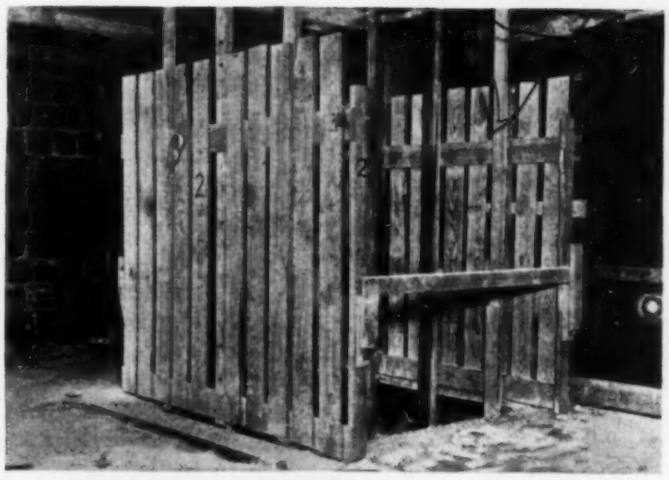
Warning Workmen—All workmen who are connected with an operation which brings them adjacent to a material hoist shaftway should be repeatedly warned of the danger. They should be taught to look for the lifting cables and not peer down the shaft to locate the car; to load the platform, when



DETAILS of recommended type of platform hoist for building construction.

PLATFORM HOISTS

WOOD RAILING and toeboard protect opening for unused shaftway.



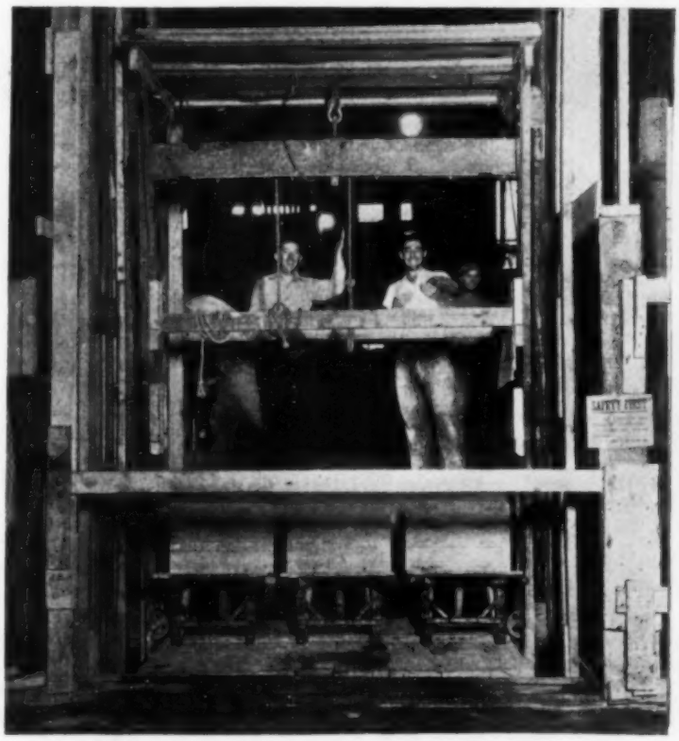
WOOD SLAT ENCLOSURE with pivoted bar guard. Vertical slats prevent use as ladder

possible, without getting on the platform itself; if working in an adjoining shaft, not to allow any board, tool or portion of their body to protrude into the shaftway; to replace guards, such as bars across the opening of the shaftways, as soon as possible after removal and to keep all small objects, such as tools and debris, away from the edges of the shaftway. The general contractor's superintendent or foreman should specifically warn the subcontractors's workmen who may have the use of the hoist as to its hazards.

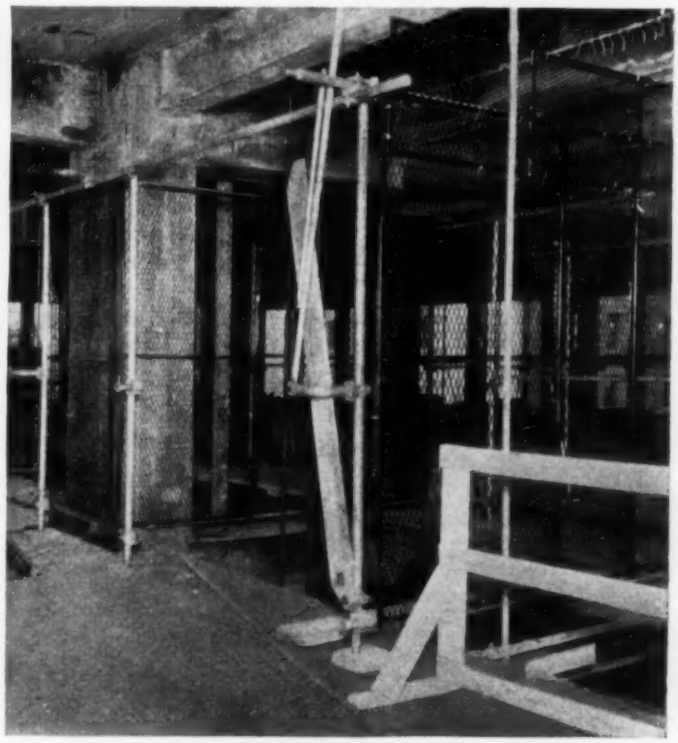
Guarding Shaftways—All material hoist shaftways within structures, when not enclosed with solid partitions, should be guarded at each floor, on at least two sides, to a height of at least 8 ft. with netting of at least No. 16 gage steel wire and a maximum mesh of 1½ in., or any other material affording equivalent strength and protection, secured to uprights so spaced as to afford a strong and substantial enclosure.

Wood slats with at least one crossbar approximately midway between top and bottom may be used in place of wire netting. Maximum openings between slats should be 1½ in. These wood slats should be placed vertically, rather than horizontally, so that they may not be used by workmen as a ladder. Wherever practicable, these enclosures should extend 2 ft. beyond the ends of shaftway openings.

All openings into the shaftway should be protected by gates or by



OVERHEAD COVERING on car intercepts falling objects. Safety sign posted at right.



GUARD RAIL GATE and pivoted wooden toeboard in raised position. Note wire mesh side enclosure.

hinged or pivoted bars of 2x3-in. spruce so placed as to be from 36 to 42 in. above the floor when horizontal and a distance of 2 ft. from and parallel to the face of the shaftway.

Toeboards should be installed on the open sides where material is not temporarily being handled.

Gates—If gates are used instead of the hinged or pivoted bars they should be of substantial material and so constructed that when they are closed the top should be at least 5½ ft. from the floor and the bottom within 6 in. of the floor. If the gate is made of slats there should be a maximum space between them of 6 in., less space being preferable. Such gates may be installed at the face of the shaftway instead of 2 ft. from the edge of the opening as in the case of hinged or pivoted bars.

Experiments to perfect a fool-proof gate to be used in connection with material platform hoists have been carried on for some time without sufficient development to meet the thorough practical and economical requirements of contractors. The greatest obstacle to overcome is to design a practical and economical gate that would extend from a point 6 in. from the floor to a point from 5½ to 7 ft. above when closed and yet, when opened, would allow sufficient headroom for workmen and which could be used on buildings with low ceilings. Such a gate, manually operated, would not be fool-proof. It would simply be a mechanical barrier requiring an electrical hook-up to prevent movement of the hoist should the gate be open.

As illustrated and described in *Construction Methods*, Nov. 1929, pp. 42-43, the General Builders' Association of Detroit has developed a gate with an electrical signaling device which is so wired that the engineer cannot receive a signal when any gate is open. Arrangement is made for him to signal back if interval is too long between signals.

Platform Hoist Towers—When a material hoist is located outside of a structure a suitable tower resting on a firm foundation should be erected for its operation. All members should be securely fastened together and the tower should be securely tied to the structure or anchored with cables.

Every hoist tower on high buildings should be enclosed for its full height with wire netting of at least No. 16 gage steel wire and a maximum mesh of 1½ in. or other equivalent incombustible material, except the sides used for the handling of material. These open sides should be protected with a bar or gate as recommended for inside hoist shaftways.

When runways are used connecting the tower to a structure the sides should be protected with railings 36 to 42 in. above the floor of the runway, with a midrail and also a toeboard at least 6 in. high.

Signals—On various types of construction work in the last few years, serious accidents have occurred owing to the fact that apparently unauthorized signals were given to the engineers operating the hoists. These signals usually come from some other floor than the floor at which the car is located and it often happens that they are given by some other trade than the trade that is using the car at the moment. The origin of the signal is not of great importance. The fact that experience shows that unauthorized signals do cause a considerable number of serious accidents is sufficient. The problem is clearly to provide a system of signals which allows complete control in operation of the material hoist in a normal manner but which prevents any person who is not using the hoist or who is not supposed to control it from causing it to move at an unexpected time.

WELL GUARDED wooden tower *(below)* with horizontal slats, for low buildings.

SIGNAL CORD *(above)* plugged into outlet for signaling to hoist operator.

JOB ODDITIES

A Monthly Page of Unusual Features of Construction

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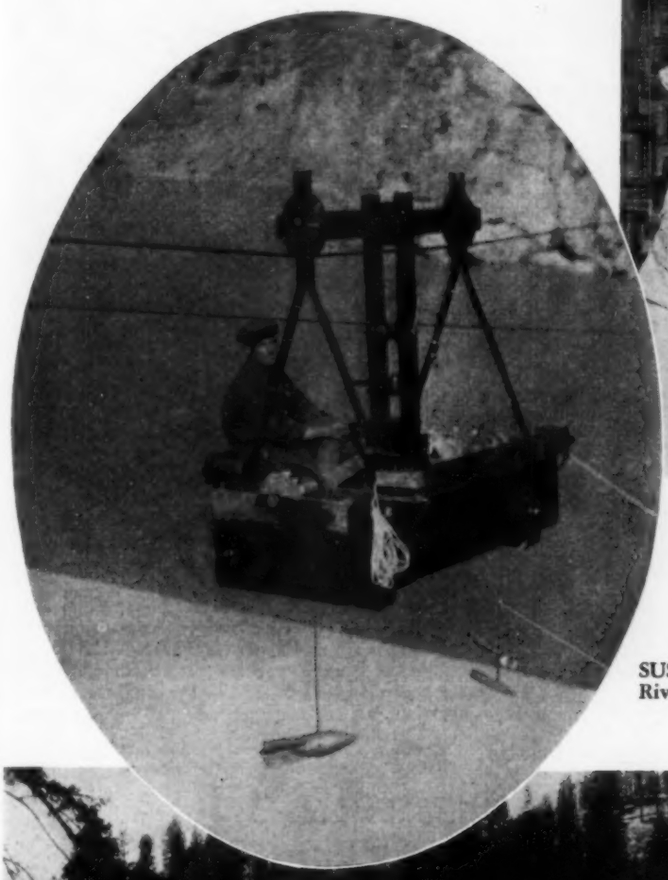
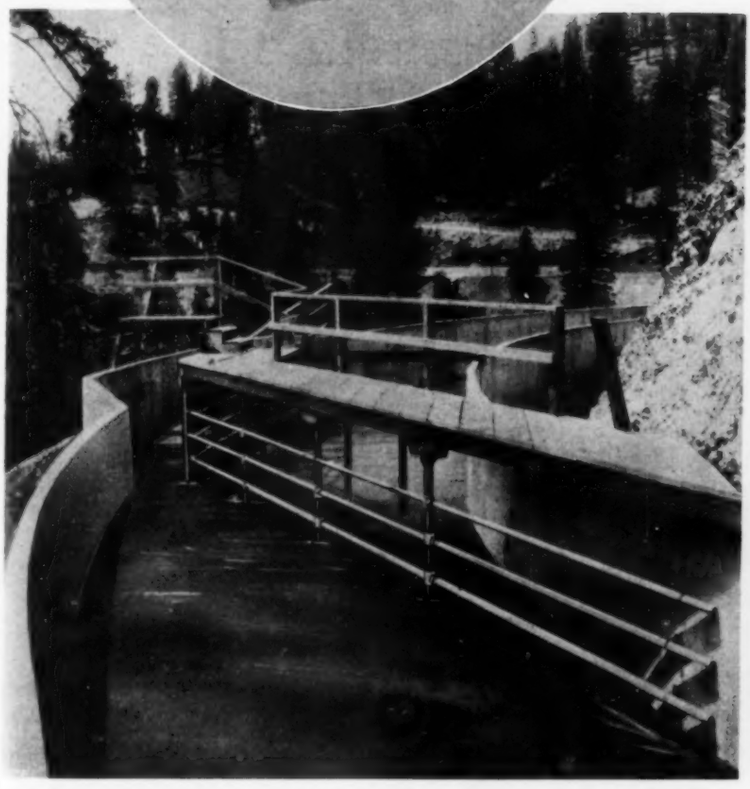
SUGAR MODEL 6 ft. high is made to celebrate opening, last month, of New Waldorf-Astoria hotel at Park Ave. and 49th St., in New York. Finishing touches by pastry cook are supervised by Oscar *(at right)*, famous maitre d'hotel.



SUSPENSION CABLE CAR *(left)* traveling over Colorado River near Hoover dam carries engineer who makes hydraulic tests with current meters and 90-lb. sounding weights.



EXIT FOR DEER is provided in Salt Springs-Tiger Creek Conduit of Pacific Gas & Electric Co.'s hydro-electric development on Mokelumne River, Washington. Pipe rail barrier leading to ramp diverts animals from swift current of flume leading to water wheels.

©Wide World

EFFECT OF WIND PRESSURE on model of 85-story Empire State Building is studied in test tunnel of U. S. Bureau of Standards at Washington, D. C. Velocities of 60 miles per hour are produced.

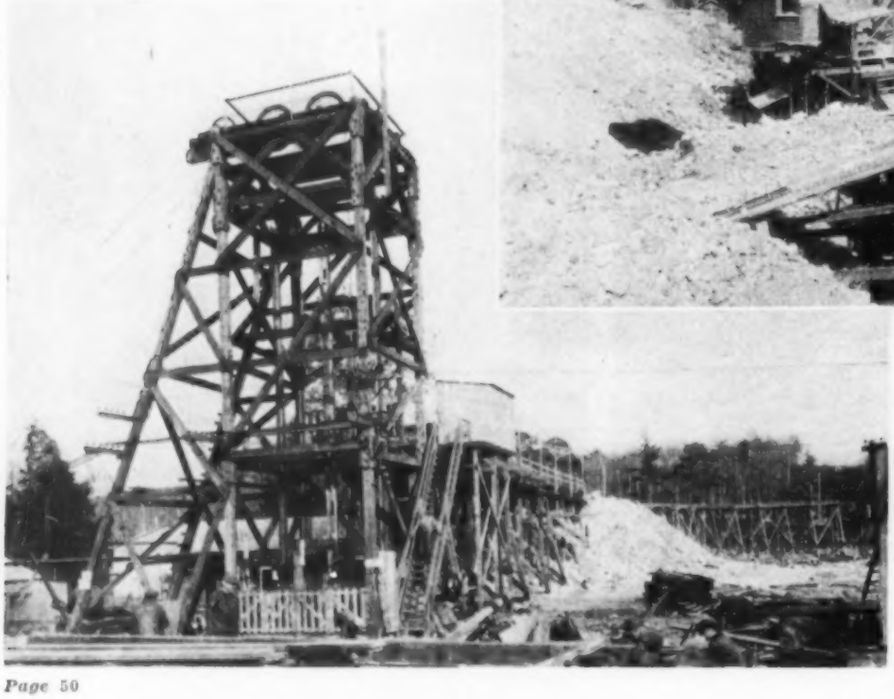
14-MILE TUNNEL

Taps Additional Water Supply for BOSTON

WITH the completion of the lining of the Wachusett-Coldbrook 14-mile tunnel, between the Ware River and the Wachusett reservoir, the city of Boston received the first unit of its system for increased water supply, which eventually will bring nearly 200 m.g.d. The next unit of the system, now under construction, will extend the tunnel 11 miles westward to the Swift river. Under the direction of the Metropolitan District Water Supply Commission, Frank E. Winsor, chief engineer, shaft sinking and tunnel construction have been in progress since March, 1927. The plan and profile indicate the principal features of the tunnel and eight shafts on the Wachusett-Coldbrook section, construction of

H. E. CARLETON *(extreme left)*, **general superintendent, West Construction Co. ENGINEERS in charge of tunnel operations:** *(left to right)* **FRANK E. WINSOR, chief engineer; WILLIAM W. PEABODY, division engineer, Wachusett-Coldbrook tunnel division; J. WALDO SMITH, formerly chief engineer, New York Board of Water Supply, consulting engineer; and X. H. GOODNOUGH, chief engineer, State Department of Public Health, consulting engineer.**

HEADFRAME OF SHAFT 4 *(below)* **is typical of structures erected over shafts 2 to 8 inclusive. Ottumwa Iron Works Co. single-drum hoist, driven by a 100-hp. G. E. motor, operates two cages in shaft. Gasoline locomotive takes muck cars over trestle from headframe to spoil bank in background.**



SURFACE PLANTS at Shaft 7 and Shaft 5 crush tunnel muck for concrete aggregates. Electric hoist operates drag scraper bucket which pulls rock from muck piles on to grizzly. Rock passes from grizzly into primary jaw crusher and then into rotary screen. Material which is too coarse to pass 1¼-in. holes is put through second gyratory crusher. Lifting magnets, suspended over conveyor belt leading from primary crusher, remove scraps of metal from aggregate.

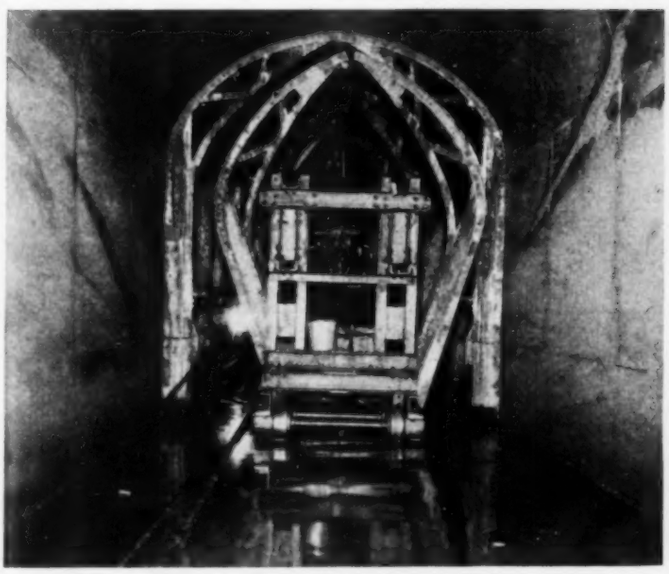
REAR, OR DISCHARGE, END of Conway mucking machine loads 46-ft. dump car at Shaft 4. Five 5-ton storage-battery locomotives, 36-in. gage, handle muck cars at this shaft. Same number serve Shaft 2. Transfer hoist, consisting of air-operated winch traveling on overhead trolley beam, shifts empty cars from storage track to loading track short distance behind mucking machine.

FRONT, OR DIGGING, END of Conway mucking machine at Shaft 4. Three of these machines at Shaft 4 and three at Shaft 2 load out muck in headings after each blast. TYPE OF AIR-DRIVEN MUCKING MACHINE *(left)* used at Shafts 5, 6, 7 and 8. Ten Hoar shovels load rock in headings of these four shafts. Mules haul cars.

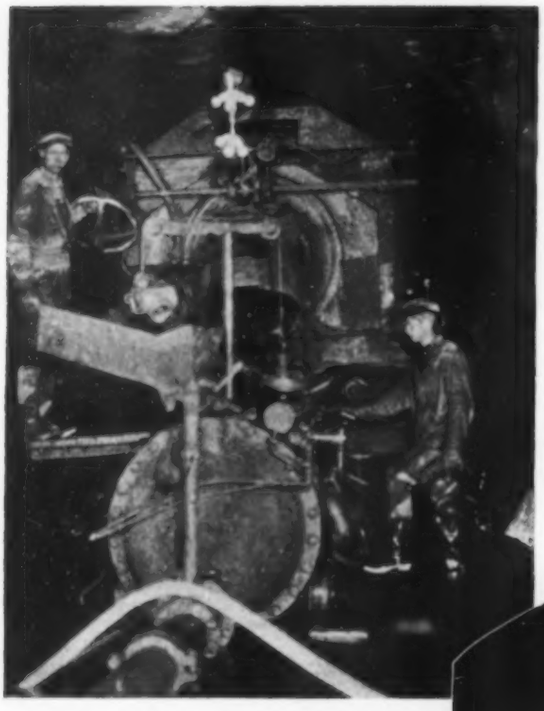
which is illustrated by the accompanying photographs.

Contractors — A number of contractors performed shaft and tunnel work on this section. The Dravo Contracting Co., Pittsburgh, Pa., sank Shafts 2, 3 and 4, and drove 3,810 ft. of tunnel from these shafts. James J. Coughlan & Sons, Inc., of Boston, Mass., sank Shafts 5, 6 and 7, and advanced the headings a total distance of 4,429 ft. from the bottoms of the shafts.

Tunnel construction proper was let in two sections. J. P. Porter & Sons were awarded the contract for the east portion; the contract for the west portion was awarded to a firm comprising J. P. Porter & Sons and James J. Coughlan & Sons, Inc. Both successful builders assigned their contracts to the West Construction Co., a Massachusetts corporation organized by the Northern Construction Co., Stewart

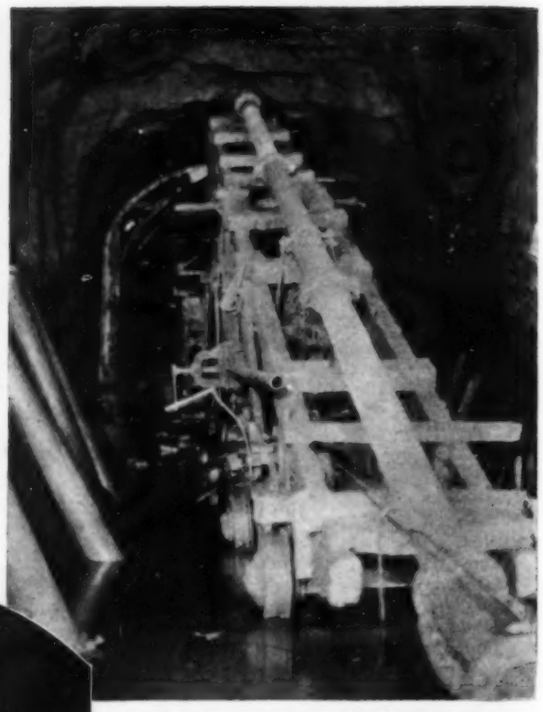


COLLAPSED STEEL FORM on traveler passes through form section erected in place for concreting. Collapsible forms, hinged at crown and at point on each side about 3 ft. above bottom, are used for arch and side walls. Eight 25-ft. sections of steel forms operate in conjunction with each concrete-placing plant. Arch and side walls are constructed for entire length before invert or shoulders are poured. Average day's output is 300 cu.yd., or 140 lin.ft. of tunnel lining, in 24 hours. With 200 ft. of forms, this rate of progress means that forms remain in place about 30 hours after concrete is poured. FORMS IN PLACE *(right)*, blocked up from bottom of tunnel. Side aprons will be braced from track with trench jacks before concreting starts. When picked up by traveler, form is jacked down, and sides are pulled in, with aprons folded up.



CONCRETE MIXER and pneumatic concrete-placing gun. Two-batch cars, hauling dry materials, are pulled up incline at rear of mixer by air hoist. Car discharges batched materials on to belt conveyor which delivers to mixer. Air-driven 7x9-in. engine runs Smith 1-yd. mixer. Mixed batch is discharged through intake at top of concrete gun, into chamber of 1-yd. capacity. After intake is closed, heavy piston is driven forward in chamber, pushing concrete through nozzle. At same time, compressed air is admitted to chamber to blow concrete through pipe into forms.

WILLIAM SMAILL *(below)*, general manager and engineer, West Construction Co.

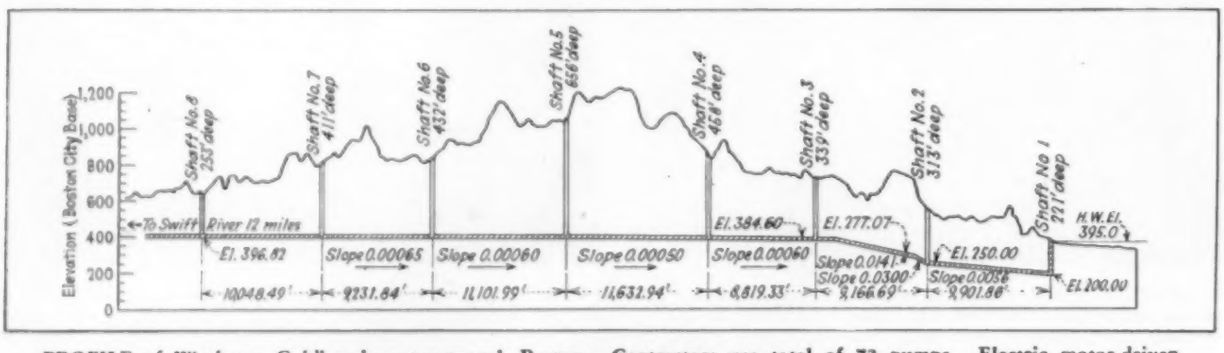


INCLINED JUMBO TRAVELER carries pipe line to top of form. Along wall of tunnel at left are sections of pipe used in line between inclined traveler and gun. Instead of following usual practice of unjointing pipe sections in narrow space between arch forms and tunnel roof as concreting progresses, contractor used 25-ft. length of pipe between traveler and gun. Sections of this 25-ft. length are disconnected and removed as forms are filled with concrete, and traveler is moved back toward concrete gun. W. F. Webb, in charge of concrete operations, developed and patented gun.

& Welch, and J. P. Porter & Sons, to undertake the tunnel work. On the west portion, this corporation was associated with J. J. Coughlan & Sons. The driving of headings from Shafts 7 and 8 was sublet to Carleton & Rankin.

Shaft Sinking—Shafts 2 to 7, inclusive, 14 ft. in diameter, were sunk by practically the same method after they had reached rock. All the shafts except No. 3 reached rock about 25 ft. below the surface. The earth sections were timbered as excavation progressed. At Shaft 3, where the earth layer was 61 ft. deep, it was necessary to use a reinforced concrete caisson of 14½ ft. inside diameter, with 32-in. walls. The caisson was sunk in 8-ft. sections. A wood or steel headframe was erected over each shaft after it has reached a depth of 60 ft.

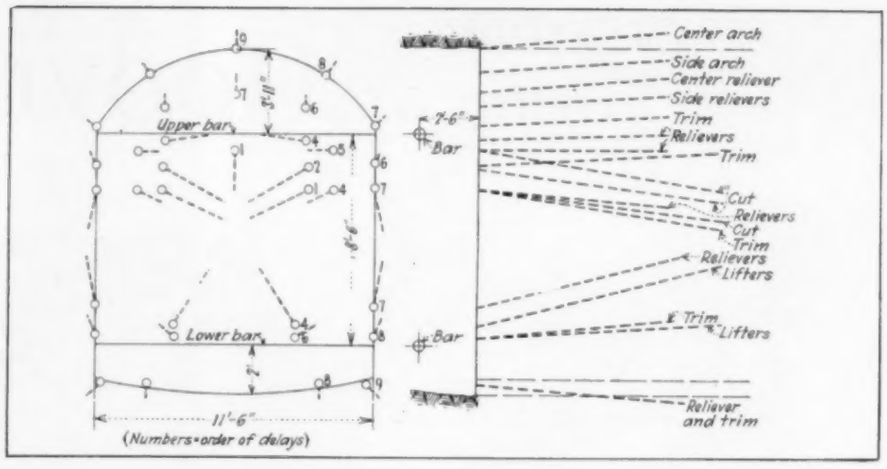
A typical drilling round at Shafts 2 to 7 consisted of 9 center cut holes 9 ft. deep, 10 relievers 8 ft. deep, and 20 rib holes 8 ft. deep. The firing order was: center cut, instantaneous;



PROFILE of Wachusett-Coldbrook water tunnel, Boston. Contractors use total of 72 pumps. Electric motor-driven centrifugal pumps, of 2½-in. to 10-in. discharge, raise water to surface at shafts. Where adverse grade makes procedure necessary, air-operated horizontal piston pumps, with 3-in. or 4-in. discharges, move water from heading to sump at bottom of shaft.

DRILLING DIAGRAM *(right)* **used in driving headings off Shafts 2 and 4, with drilling machine carrying two horizontal bars. Three drills on upper bar and two drills on lower bar sink holes for blasting full face of heading, as indicated in the following table:**

Name of Hole	No. of Holes	Average Depth Each Hole	Total
UPPER RIGHT DRILL			
Trim	2 Under Bar	10'0"	20'0"
	1 Over Bar	8'0"	8'0"
Cut	2 Under Bar	10'0"	20'0"
Relievers	3 Under Bar	8'6"	25'6"
Total	8 Holes		73'6"
UPPER CENTER DRILL			
Trim	3 Over Bar	8'0"	24'0"
Relievers	3 Over Bar	8'6"	25'6"
	1 Under Bar	8'6"	8'6"
Cut	1 Under Bar	10'0"	10'0"
Total	8 Holes		68'0"
UPPER LEFT DRILL			
Trim	2 Under Bar	10'0"	20'0"
	1 Over Bar	8'0"	8'0"
Cut	2 Under Bar	10'0"	20'0"
Relievers	2 Under Bar	8'6"	17'0"
Total	7 Holes		65'0"
LOWER LEFT DRILL			
Lifters	2 Over Bar	10'0"	20'0"
Trim	1 Over Bar	8'0"	8'0"
	1 Under Bar	8'0"	8'0"
Relievers	1 Over Bar	8'6"	8'6"
	1 Under Bar	8'6"	8'6"
Total	6 Holes		53'0"
LOWER RIGHT DRILL			
Lifters	2 Over Bar	10'0"	20'0"
Trim	1 Over Bar	8'0"	8'0"
	1 Under Bar	8'0"	8'0"
Relievers	1 Over Bar	8'6"	8'6"
	1 Under Bar	8'6"	8'6"
Total	6 Holes		53'0"
Grand Total	35 Holes		312'6"



relievers, second delay; rib holes, third delay.

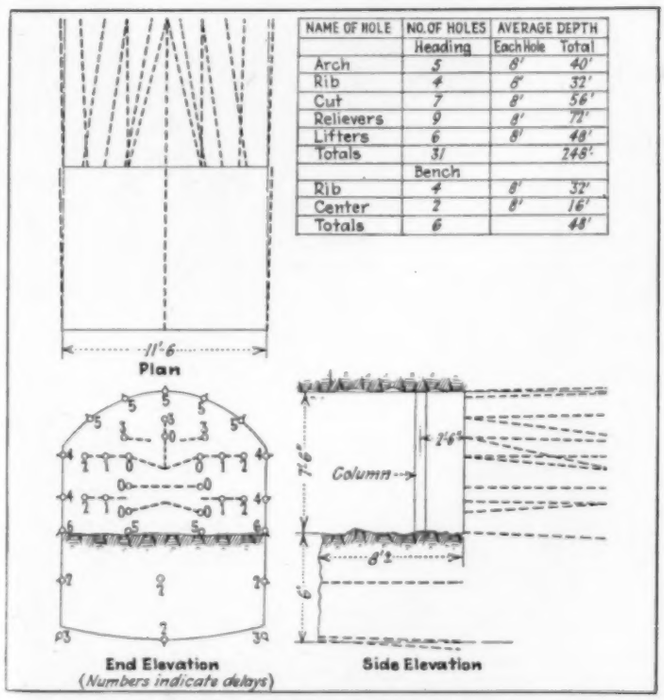
Shaft 8, the intake, is 20 ft. in diameter. A typical drilling round in this shaft consisted of 8 center cut holes 9 ft. deep, and three concentric rings, all 7 ft. deep of 10, 16 and 40 holes. The center cut and each ring were fired separately.

Shaft 1, the tunnel outlet, has a modified elliptical cross-section, to accommodate two steel risers, one for ordinary discharge and another for pumping out the tunnel if necessary. Rock blasting was carried on in two parts, a center section being fired in the first blast, and two end sections in a second blast. The two shots required a total of 49 holes 9 ft. deep, fired in four delays.

Tunnel Driving and Concreting—Methods of driving headings from the different shafts and of placing the interior concrete lining are covered by the illustrations and captions. As the West Construction Co. was managing the entire tunnel construction as a unit, it divided the driving and concreting operations to gain maximum efficiency and progress with the greatest economy of labor. Headings were driven both ways from Shafts 2, 4, 5, 6, 7 and 8, and a heading was driven a short distance in one direction from Shaft 1. To balance operations at Shaft 8, the contractor was permitted to drive westward a distance of 5,000 ft., which brought the total length of bore driven under these contracts to 14.2 miles.

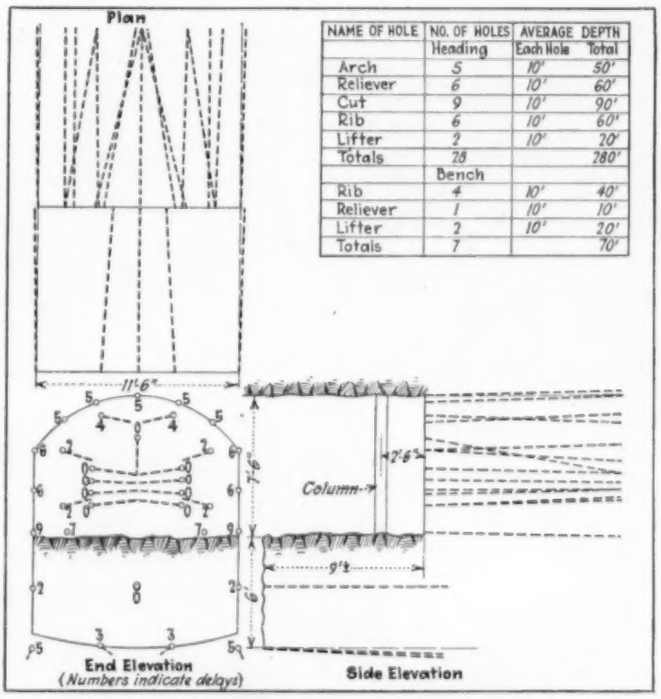
In driving full-face headings on the east portion of the tunnel, the drilling and mucking crews worked three 8-hour shifts. The crews alternated between the two headings driven from a shaft.

On the west portion, where the heading and bench method was used, the crews remained at the face, alternately drilling and mucking. In this part of the tunnel, mules hauled the muck cars to the shaft. At Shafts 2 and 4, on the east portion, the cars were handled by storage-battery locomotives.



NAME OF HOLE	NO. OF HOLES Heading	AVERAGE DEPTH Each Hole	Total
Arch	5	8'	40'
Rib	4	8'	32'
Cut	7	8'	56'
Relievers	9	8'	72'
Lifters	6	8'	48'
Totals	31		248'
	Bench		
Rib	4	8'	32'
Center	2	8'	16'
Totals	6		48'

HEADING-AND-BENCH METHOD is followed at Shaft 6. Shaft 5 employs similar plan, but with one less cut hole and four less relief holes.



NAME OF HOLE	NO. OF HOLES Heading	AVERAGE DEPTH Each Hole	Total
Arch	5	10'	50'
Reliever	6	10'	60'
Cut	9	10'	90'
Rib	6	10'	60'
Lifter	2	10'	20'
Totals	28		280'
	Bench		
Rib	4	10'	40'
Reliever	1	10'	10'
Lifter	2	10'	20'
Totals	7		70'

DRILLING DIAGRAM for heading-and-bench method adopted at Shaft 7. Drifter drills on columns sink heading holes. Horizontal bar is used for bench drilling.

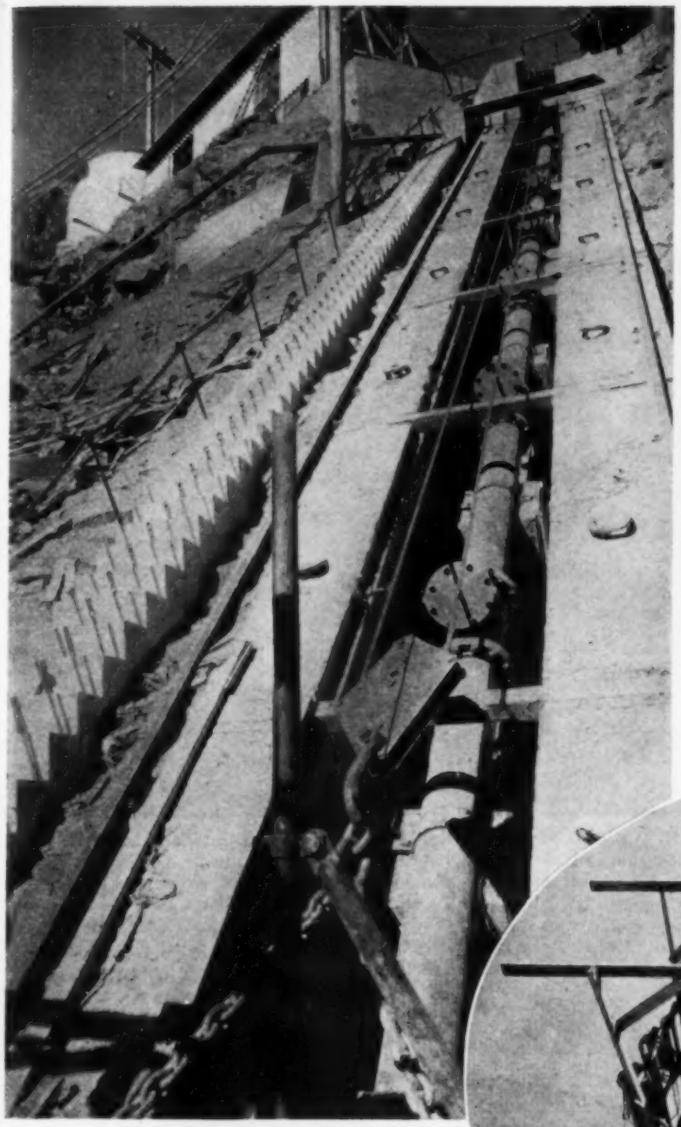
Construction Activities at HOOVER DAM

BOULDER CANYON of Colorado River, looking downstream toward site of Hoover dam. Power shovel, at right, is opening up road along cliff in foreground. Roads in background lead to portals of diversion and spillway tunnels.

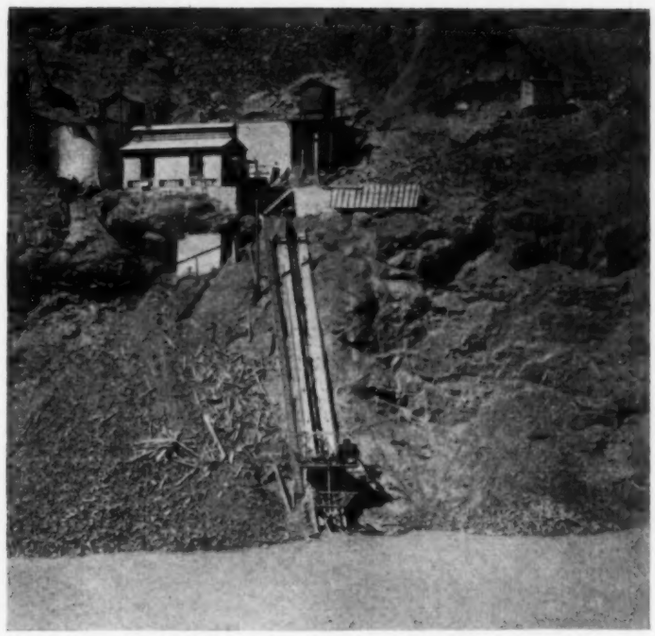
POWER SHOVEL *(above)* removes muck from portal of No. 4 tunnel along canyon side.

TRENCH EXCAVATOR *(above)* digs ditch to receive vitrified tile pipe for sewerage system of Boulder City.

HOUSING *(right)* for contractor's men. Six Companies, Inc., has constructed more than two hundred wood frame buildings for its employees.

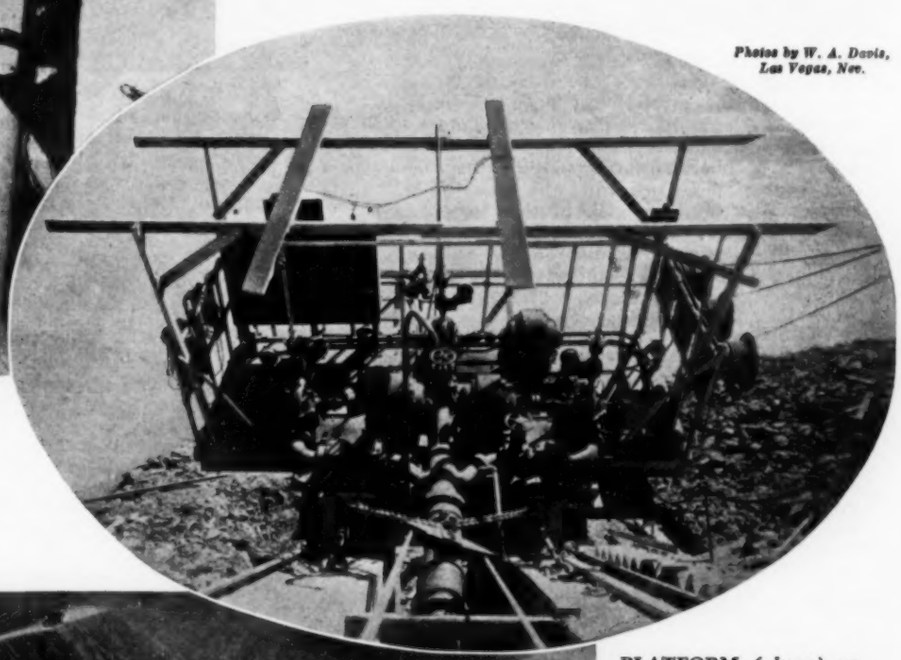


INCLINED INTAKE PIPE for pumping plant is provided with connections at different levels to accommodate pumping units as they move up or down along inclined track.



PUMPING PLANT, taking water from Colorado River for domestic supply at Boulder City, is mounted on movable platform which may be raised or lowered on inclined track.

Photos by W. A. Davis, Las Vegas, Nev.

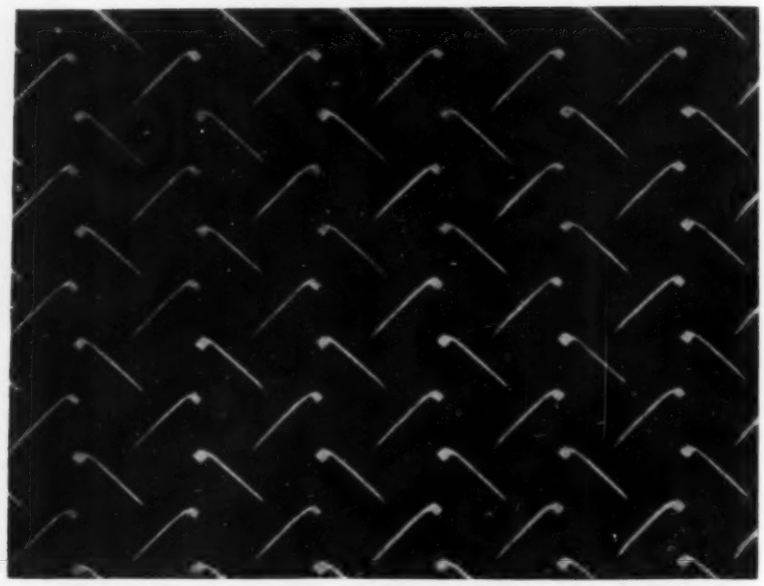


PLATFORM *(above)* on inclined track carries electrically driven pumping units.

CLARIFIER *(left)* removes silt from Colorado River water before it is pumped to Boulder City.

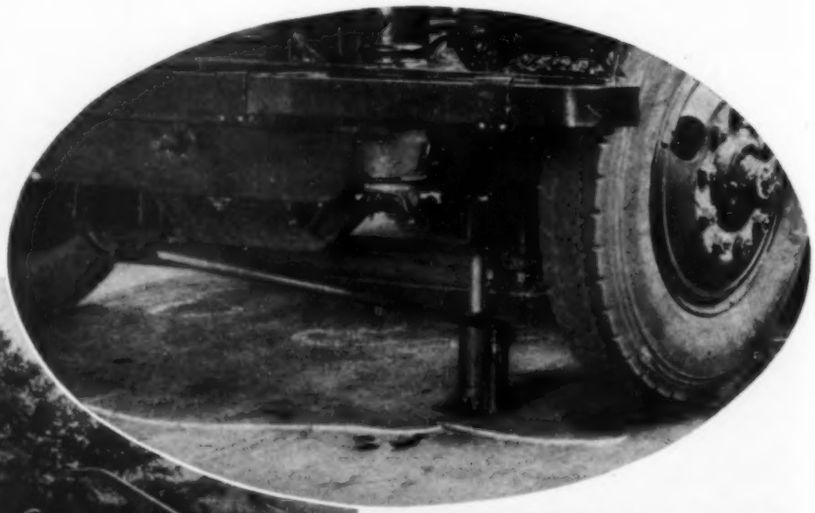
NEW EQUIPMENT

LIGHT DRILL SHARPENER, weighing 350 lb. and occupying floor space 18 in. square, makes cross or rose bits to 2½ in. maximum gage on ¾- or 1-in. steel and forges collar shanks. Dies are available for any steel section. Machine makes double-taper bits and forms and sharpens concrete-breaker pick or chisel bits on 1¼-in. hexagonal steel. It is claimed that sharpener can be operated from portable compressor without pulling down pressure at other tools.—Sullivan Machinery Co., 400 N. Michigan Ave., Chicago.



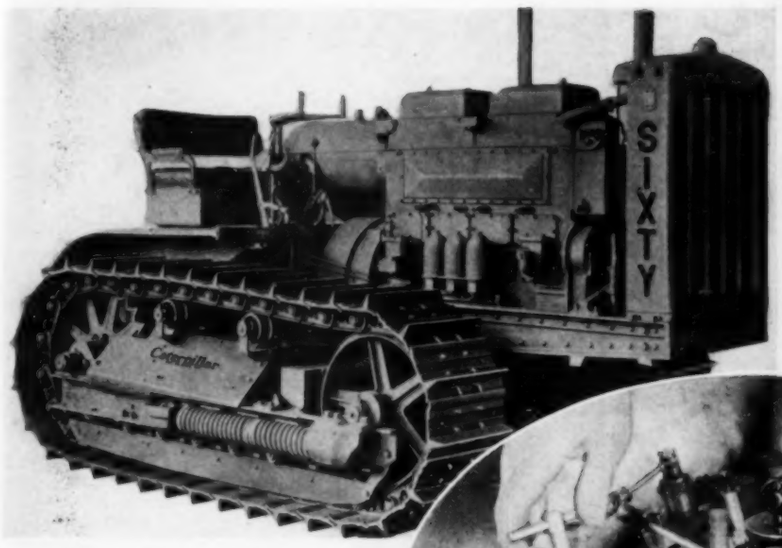
FOUR-WAY STEEL FLOOR PLATE consists of short lineal projections arranged alternately at right angles to each other. This pattern permits less weight per square foot without loss of strength. Nonskid regardless of direction of traffic. Individual plates may be laid in any relation to each other without altering design. Pattern also assures efficient drainage and easy sweeping.—Inland Steel Co., First National Bank Bldg., Chicago, Ill.

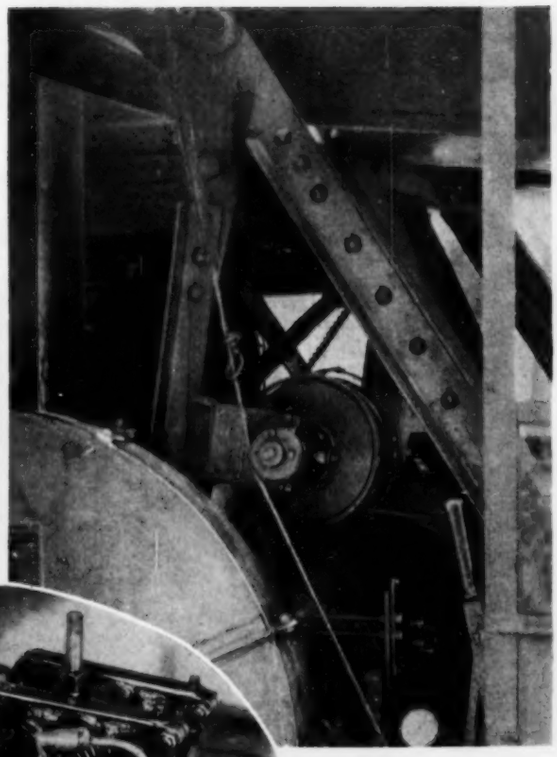
11-FT. SHOVEL *(below)*, called the "Badger," convertible to backfiller, trench hoe, dragline or crane. Cut gearing enclosed and running in oil. Ball or roller bearings, fully enclosed and sealed. Has full three-quarter swing of 270 deg. Specially constructed curved boom coupled with long dipper handles gives bucket exceptionally high lift. Travels 4 miles an hour. Other features, booster type clutches, readily renewable brakes and high pressure lubrication. — Austin-Western Road Machinery Co., 400 North Michigan Ave., Chicago, Ill.

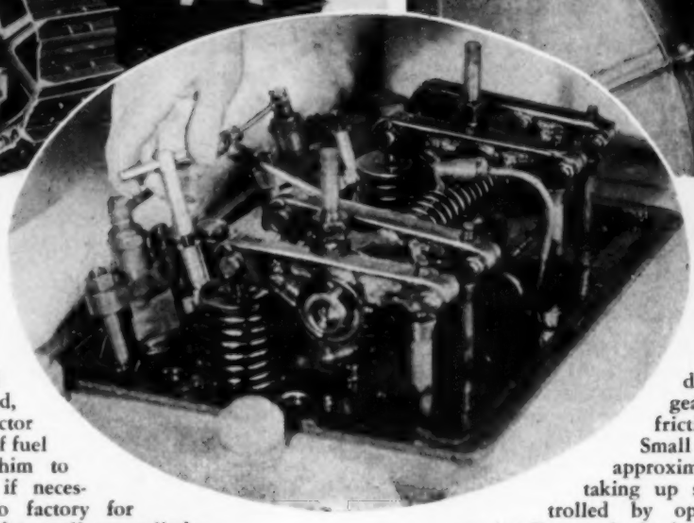


LIGHT-WEIGHT HYDRAULIC JACKS have rated lifting capacity of 4½ tons, with large margin of safety. One jack, 8½ in. high, weighing 17 lb., has hydraulic lift of 5¼ in. Second jack, 10 in. in height and 20 lb. in weight, has 7¼-in. lift. Sled base and 3¼-in. hand extension on each jack aid easy placement. Equipment includes 34-in., two-piece handle.—Blackhawk Manufacturing Co., Milwaukee, Wis.

on the Job







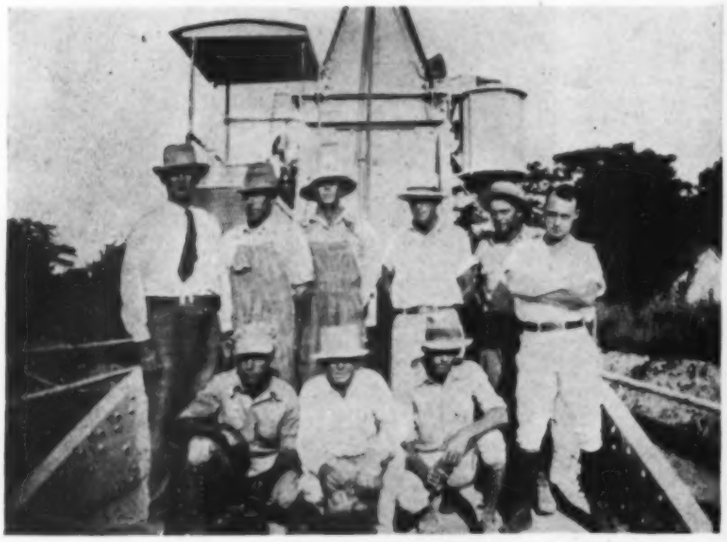
DIESEL - POWERED TRACTOR *(above and right)* developing 63 hp. drawbar pull and 75 belt hp. uses oil normally selling for one-third to one-half cost of gasoline and, according to report, consumes 30 to 40 per cent less fuel than gasoline engine of equal power. Outstanding feature of engine is fuel injection apparatus, adjusted, regulated, timed and sealed at factory. Tractor owner is supplied with duplicate set of fuel injection apparatus which enables him to make replacement quickly in field if necessary, and to return original set to factory for adjustment. Diesel engine is started by small two-cylinder gasoline motor mounted alongside main power unit. Precombustion chamber consumes definite amount of fuel, preserving proper thermal conditions and assuring positive ignition at slow speeds and after long period of idling. Single lever at driver's seat controls engine speed. Variable speed governor provides superior acceleration and flexibility. Shipping weight is approximately 25,000 lb.—Caterpillar Tractor Co., Peoria, Ill.

MECHANICAL DIPPER TRIP installed on shovel, skimmer scoop or pull shovel eliminates jerking on trip rope and increases production. Unit consists of shaft, running continuously, driven by one of shovel gears. On shaft are two friction disks and a drum. Small spring-actuated disk exerts approximately 7-lb. pull on line taking up slack. Larger disk, controlled by operator, exerts pull up to 400 lb. to trip latch. Dipper tripping control is made part of one of regular operating levers. Operator bends hinged handle of lever to left to pull trip line and release latch. Mechanical trips for ten makes of shovels are carried in stock. Same unit can be used as tag-line winder on clamshell work or to dump tip-over and bottom-dump buckets.—Morin Mfg. Co., Holyoke, Mass.

POWER COLD-TAR AND ASPHALT EMULSION SPRAYERS, for penetration work in construction and maintenance of pavement or for curing concrete and waterproofing, are equipped with combination gasoline-engine compressor units. Machine shown has 60-gal. tank filled by power unit at rate of 5 min. per shipping drum. Power unit provides steady 45-lb. pressure in tank, forcing emulsion through 25 ft. of hose to 6-ft. spray bar. Lighter hand-pump machine for same service applies material direct from shipping drum, which is loaded quickly on truck by tipping chassis. Power sprayer designed for applying bituminous emulsion to concrete is equipped with 3-hp. gasoline-engine compressor unit which also operates geared suction pump. Material is automatically agitated and pumped at 45-lb. pressure from shipping drum to spray bar, where it is atomized by compressed air at about 60-lb. pressure. All spray bars have rotary spray nozzles and spring trigger valves. —Hauck Manufacturing Co., 126 Tenth St., Brooklyn, N. Y.

Present and Accounted For —

A Page of Personalities



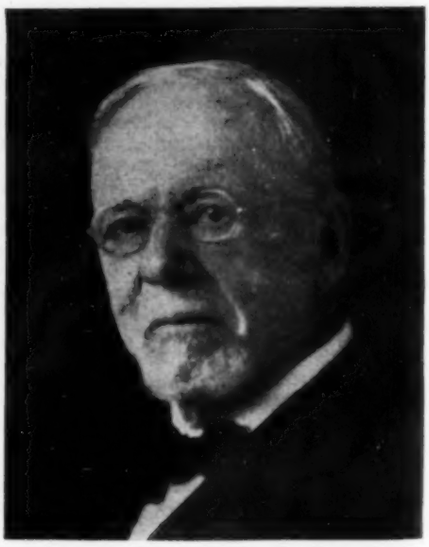
PAVING CREW of J. B. McCrary Co., contractor of Atlanta, Ga., which made rapid progress on 18-ft. concrete highway in Alabama. Poured 52,903 lin.ft. of 9-6-9-in. slab in 52 days; best single day, 2,116 lin.ft. in 15¼ hr. *(Left to right, back row)* McCONNELL, general foreman; RICH, mechanic; McINNIS; MAXWELL, grade foreman; SMITH, grader operator; MOULTRIE, superintendent. *(Front row)*, GRAY, tractor operator; SPIVEY, finishing machine; McDANIELS, forms.

G. H. BLAKELEY, for many years a prominent figure in the structural steel industry, was appointed president of the McClintic-Marshall Corp., when that organization was recently acquired by and made a subsidiary of the Bethlehem Steel Corp. As vice-president of the Bethlehem company, Mr. Blakeley has been active in developments which fostered modern skyscraper and bridge construction.

FREDERIC E. EVERETT *(below)*, commissioner of the New Hampshire State Highway Department, was elected president of the American Association of State Highway Officials at its annual meeting, last month, in Salt Lake City, Utah.

BRIDGE ENGINEERS for structure of new type. C. B. McCULLOUGH *(right)* of Oregon Highway Commission, and MARSHALL DRESSER, resident engineer, have charge of Rogue River bridge, comprising seven 230-ft. Freyssinet concrete arch spans.

FAYETTE F. FORBES *(below)* has completed 56 years of service as engineer and superintendent of water works at Brookline, Mass. He was a pioneer in the use of the microscope to trace tastes and odors in water and did notable work in preventing water waste.



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LINN Model 6-28 D being operated in "Pit" for United Verde Copper Company, at Jerome, Ariz. Pay load carried is copper ore, weighing ten tons—one of a fleet of LINN'S cutting costs in copper mining.

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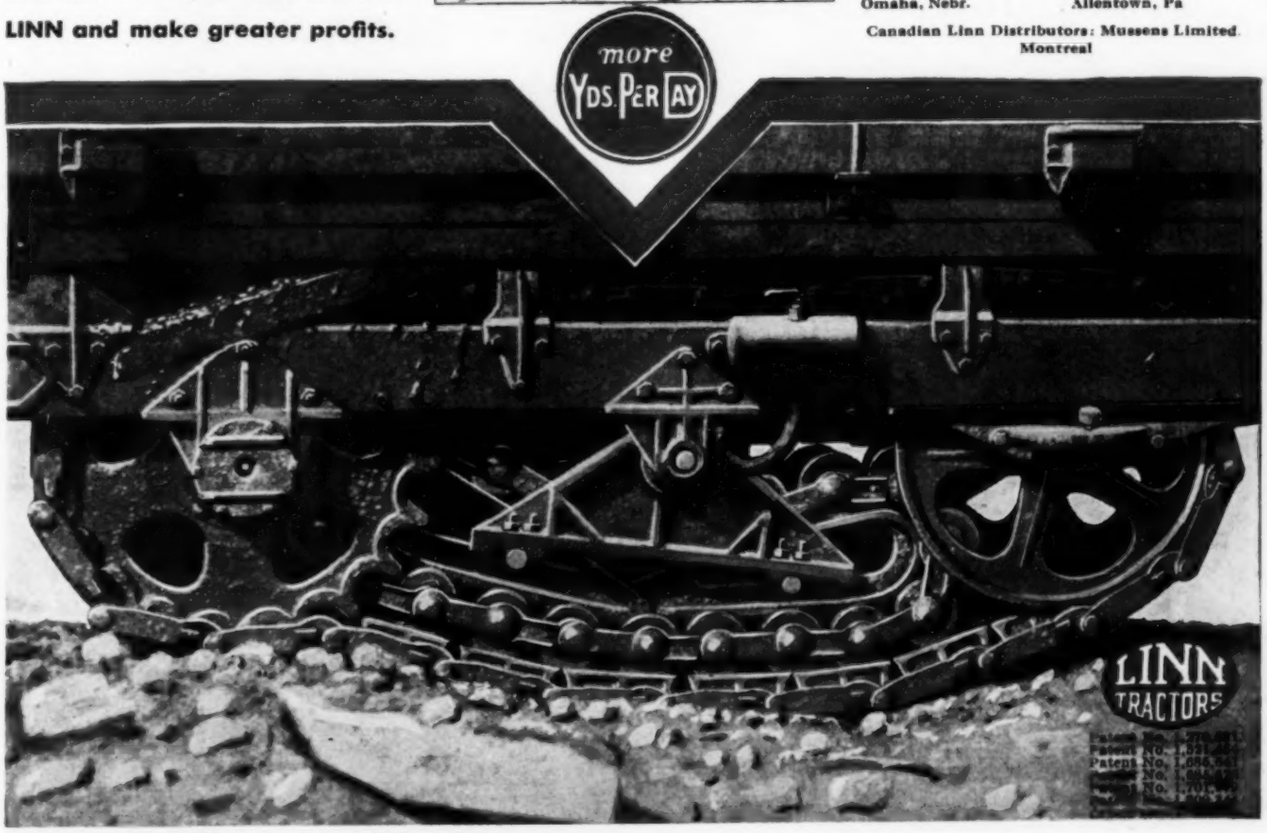


Whose $1,000.00 Is It?

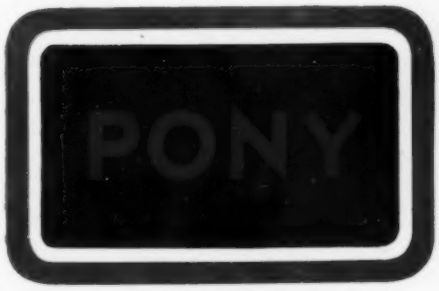
WHEN a contractor sets out to buy moving machinery the cost of operation is one of his important yardsticks. When he is about to buy shovels, what about this same factor? Actually the cost of operating a shovel is so many, many times the cost of the shovel itself that price is a drop in the bucket.

A shovel costs the employer at least $1,000.00 to operate. That is to say, a real shovel should remain in first-class condition long enough to accumulate $1,000.00 worth of pay-roll.

Whose $1,000.00 is that? Whose pocket does it come from?

You can be sure that when piece-work shovelers buy, they ask "what is the largest shovel you make?" . . . "How tough is it?" . . . "And how long will it last?" They are interested in size, wearing qualities, balance, weight and everything that increases the output of that shovel.

The judgment of these critics is worth something—they are both owners and operators. Send now for literature that will give you the fundamentals of good shovel buying. Turn a little winter reading into spring profits. Remember it's your $1,000.00!



For the Contractor . . .

The Big Four!

FOR years piece-workers have bought one of the Big Four—Pony, Genuine O. Ames, Monongah or Wyoming Red Edge. These shovels have earned their reputation by earning *more* money for the owner.

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These shovels never deliver toy loads. They bite into work and pick up a load that justifies every move of the operator. A shovel can be *so* true, *so* balanced, *so* carefully designed for the work to be done that it sets a pace for the laborer who swings it. The Big Four have these qualities, balancing them to meet the contractor's needs pretty much as the contractor sees his own requirements.

Remember the names as the first step in shovel selection. Here they are again: Pony, Genuine O. Ames, Monongah, Wyoming Red Edge—all backed by the resources and experience of Ames-Baldwin-Wyoming Shovel Co. You will find distributors everywhere.

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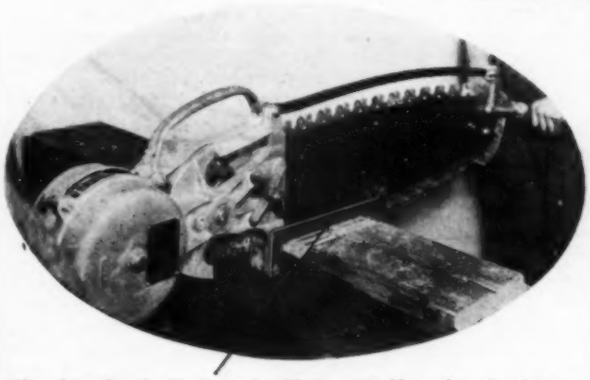
The Timber Wolf

Portable Sawing Machine



Showing the A. C. Electric Timber Wolf equipped with an adjustable gauge for notching, as in trestle work, bridge timbers, etc. A series of cuts are taken and then broken out with a chisel. On every timber sawing job, this fast, powerful machine cuts labor costs to a fraction. A.C. and D.C. Electric or Air Driven. Write for further information.

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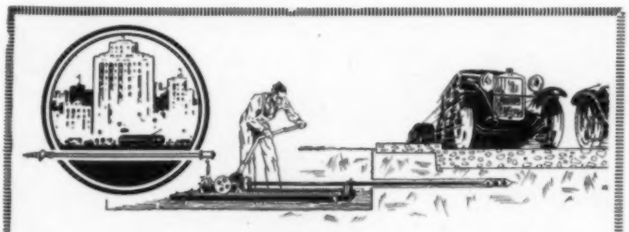

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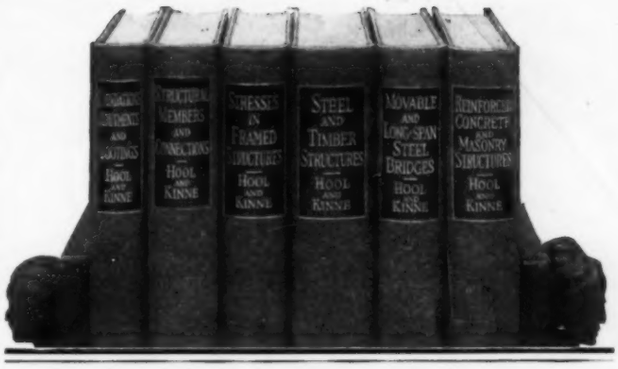

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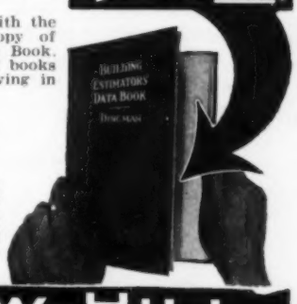

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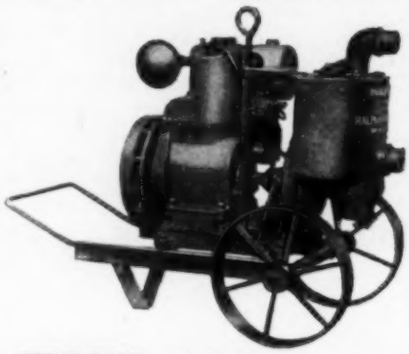

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Of Construction Methods, published monthly at New York, N. Y., for October 1, 1931.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared C. H. Thompson, who, having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of Construction Methods, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

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